Performance Monitoring Report
Round 87, March 2020

Former Rhone-Poulenc Site
Tukwila, Washington
Project # 0087690050 | Container Properties, LLC

Prepared for:

Container Properties, LLC
Kent, Washington

May 26, 2020

Performance Monitoring Report Round 87, March 2020

Former Rhone-Poulenc Site
Tukwila, Washington
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Prepared for:

Container Properties, LLC
Kent, Washington

Prepared by:

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May 26, 2020

Third-party disclaimer

Performance Monitoring Report
Round 87, March 2020
Former Rhone-Poulenc Site
Tukwila, Washington

May 26, 2020
Project # 0087690050.00002

This report was prepared by the staff of Wood Environment & Infrastructure Solutions, Inc., under the supervision of the Hydrogeologist whose seal and signature appear hereon.

The findings, recommendations, specifications, or professional opinions are presented within the limits described by the client, in accordance with generally accepted professional engineering and geologic practice. No warranty is expressed or implied.

Kathleen Goodman, P.G., L.G., L.Hg.
Licensed Geologist/Hydrogeologist #1786
Expiration Date: September 6, 2020

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1.0 Introduction

Container Properties, LLC, constructed a hydraulic control interim measure at the former Rhone Poulenc Marginal Way facility (the site) from January through April 2003, consistent with the Interim Measures Construction Work Plan (URS, 2002) approved by the U.S. Environmental Protection Agency (EPA). The key components of the hydraulic control interim measure are a low permeability subsurface barrier wall surrounding the contaminated area, a groundwater recovery system to maintain an inward hydraulic gradient, and a performance monitoring well network on the exterior and interior of the barrier wall.

Wood Environment and Infrastructure Solutions, Inc. (Wood) is conducting performance monitoring of the hydraulic control interim measure in accordance with the revised Interim Measures Performance Monitoring Plan (AMEC Geomatrix, 2009). The 46th post construction performance monitoring event (Round 87) occurred from March 18 to 20, 2020. This report presents the results of the Round 87 groundwater monitoring event. This semiannual event covers the period from October 2019 through March 2020.

2.0 Methodology

Figure 1 shows the location of the monitoring wells at the former Rhone-Poulenc site and indicates the frequency of water level measurements and groundwater sampling for each well. Table 1 lists the well ID, depth, and screened interval for each of the performance monitoring wells that were monitored using chemical analyses.

Dedicated QED low-flow bladder pumps were installed in the performance monitoring wells in September 2002. The pumps are equipped with Teflon bladders and Teflon-lined polyethylene tubing. A specialized MicroPurge® QED pump controller and auto battery powered QED air compressor were used to sample the wells. Exterior wells were sampled during the ebb tide, as determined using data from the Tidal Study (AGI Technologies, 1999). Wells without an existing tidal record were sampled based on an evaluation of the tidal delays in the nearest wells with similar screen depth intervals.

Purging and sampling were conducted in accordance with the procedures and techniques described in the Quality Assurance Project Plan (Amec Foster Wheeler, 2016). General field parameters—temperature, pH, specific conductivity, oxidation-reduction potential (ORP), dissolved oxygen, and turbidity—were measured in the field for each well during purging. A YSI Pro DSS multi-parameter meter with a flow cell was used to measure water quality parameters during the sampling event. Parameter values and water levels were recorded by hand on field data sheets (Appendix A).

Purging continued until field parameters stabilized within the limits established in the EPA Region II Groundwater Sampling Procedure Low Stress (Low Flow) Purging and Sampling guidelines (EPA, 1998), with two exceptions. The first exception was that turbidity readings at wells MW-39, MW-41, MW-42, and MW-45 did not stabilize after purging due to off-gassing of the groundwater, which causes effervescence of small bubbles. These small gas bubbles coalesce on the turbidity sensor and potentially interfere with turbidity readings. The second exception was that ORP at well MW-40 did not stabilize after 60 minutes of purging. Despite these difficulties, groundwater samples were collected, because the turbidity sensor was believed to be correctly measuring turbidity. Groundwater sampling data sheets for this event are contained in Appendix A.

The groundwater samples were submitted to Analytical Resources, Inc., a Washington State Department of Ecology-accredited laboratory located in Tukwila, Washington. The samples were analyzed for the following organic and inorganic constituents of concern:

- Benzene, toluene, ethylbenzene, and xylenes by EPA Method 8260C;
- Total metals (aluminum, arsenic, cadmium, chromium, copper, lead, nickel, selenium, thallium, vanadium, and zinc) by EPA Method 200.8; and
- Total mercury by EPA Method 7470A.

3.0 Results

This section presents the results of the groundwater performance monitoring event completed in March 2020 (Round 87). Section 3.1 presents the general field parameter results, and Section 3.2 presents the water level measurements. Section 3.3 presents the analytical results, and Section 3.4 describes the quality assurance/quality control review. Section 3.5 discusses problems encountered during Round 87 sampling.

3.1 General field parameters

Table 2 lists the general field parameter readings that were collected from the 12 sampled wells at the end of the low-flow purge just prior to sampling. The field parameter data are generally consistent with data from the previous direct-push investigation and from previous sampling rounds:

- Elevated pH readings (>10 pH units) were noted in the groundwater samples from exterior wells MW-41, MW-43, and MW-44.
- Negative dissolved oxygen readings were recorded for wells B1A, MW-41 through MW-45, and EX-3. However, these readings are likely due to probe miscalibration because a negative dissolved oxygen is impossible; consequently, these the results are considered to be 0.00 milligrams per liter. The positive dissolved oxygen readings ranged from 0.00 to 0.15 milligrams per liter.
- ORP ranged from −482.0 to −66.4 millivolts. A stabilized ORP value could not be obtained after an hour of purging for MW-40; the last ORP value recorded during groundwater sampling was presented in Table 2.
- Stabilized turbidity values could not be obtained for MW-39, MW-41, MW-42, or MW-45 due to gas bubbles on the probe; the last turbidity value recorded during groundwater sampling was presented in Table 2.

3.2 Water level measurements

Table 3 provides the historical depth-to-water measurements, top-of-casing (TOC) elevation, and groundwater elevations for the wells measured during the March 2020 water level measurement event. The reference datum for the TOC elevations in Table 3 is the North American Vertical Datum of 1988 (NAVD88). The TOC elevations and ground surfaces were surveyed by Barghausen Associates, Inc., in October and November 2006 after completion of site redevelopment.

Figure 1 shows the monitoring well network. Figure 2 presents the 72-hour average water levels for the two control wells, DM-8 and MW-49, for January 1 through March 31, 2020. Figures 3 through 11 present trends in the water level elevations from January 2008 through March 2020 for all the monitoring wells, grouped into representative clusters of wells.

3.3 Analytical results

The analytical results for the groundwater samples collected during Round 87 are presented in Table 4. Figure 12 shows the concentrations of toluene, arsenic, and copper, and the associated pH readings for each of the sampled wells. Figures 13 through 40 are plots of toluene, total arsenic, total copper, and total aluminum concentrations over time in groundwater samples collected during Round 87 and prior groundwater sampling events. Figures 41 through 52 are plots of total chromium, total lead, and total vanadium in groundwater samples collected from select monitoring wells with concentrations that have exceeded the current EPA preliminary remediation goals (PRGs) since 2003.

During groundwater sampling events conducted prior to Round 17, groundwater samples were collected from some wells during both high tide and low tide. Thus, additional data were available for wells DM-8, MW-17, MW-27, MW-28, and MW-29. For consistency with later sampling events, only the data from the low-tide samples were used in these trend plots. Historical trend data for toluene, total arsenic, and total copper were extracted from the Round 15 Groundwater Monitoring Report (GeoEngineers, 2002). The trend plots for each analyte were all plotted using axes with identical scales for ease of comparison.

3.4 Quality assurance/quality control discussion

A data quality review was performed for each sample group. Copies of the analytical reports and the associated data quality review memorandum are included in Appendix B. It should be noted that the original laboratory analytical reports were submitted by Analytical Resources Inc. as an electronic PDF, which is included on a compact disk as along with the report PDF file.

Our data quality review was based on method performance and quality control criteria, as specified in the Quality Assurance Project Plan (Amec Foster Wheeler, 2016). Hold times, initial and continuing calibrations, method blanks, surrogate recoveries, laboratory duplicate results, field duplicate results, matrix spike/matrix spike duplicate results, and reporting limits were reviewed to assess compliance with applicable methods and project requirements. If data qualification was required, data were qualified in general accordance with the definitions and use of qualifying flags outlined in EPA guidance documents (EPA, 2014a and b). Total aluminum, chromium, mercury, and copper results were qualified as estimated in some samples due to laboratory duplicates. No other data were qualified.

3.5 Problems encountered during October 2019 through March 2020

The groundwater pretreatment system operated continuously and in compliance with the King County discharge permit from October 1, 2019, through September 30, 2020, except during the following periods:

- During the semi-annual groundwater monitoring event on March 18, Wood noticed that all three groundwater extraction pumps had been activated and had been running for several days, which is not typical for the system. Further inspection revealed that the water level transducer in MW-49, which is inside the barrier wall, had failed. The water level reported by the transducer was approximately 1 foot more than the manually measured water level. The erroneous water level readings caused the groundwater pretreatment system to activate all three extraction pumps. Wood manually turned off the extraction pumps on March 18, 2020, and they remained off until a new transducer was installed and confirmed to be calibrated on March 23, 2020. The EPA was notified of the control transducer failure in an email dated March 26, 2020, and this issue was discussed in greater detail in the March monthly progress report.

Minor operational maintenance issues encountered during this period included:

- The transducer in MW-53 was temporarily relocated to MW-49 from March 18 to March 21, 2020, due to the MW-49 transducer failure discussed above.
- Troubleshooting a leak in the conveyance piping for EX-3, which interfered with automatic operation of EX-3. Any leakage from the EX-3 conveyance piping will be contained within the barrier wall.
- Troubleshooting the effluent flow meter, which was under-reporting the flow rate. Attempts to clean the electrode were unsuccessful; therefore, the sum of the three influent flow meters was used for reporting purposes.
- When the MW-49 transducer failed as described above, the resulting flow exceedances should have resulted in an autodialer alarm callout; however, no calls were received. On March 26, 2020 Wood tested the autodialer by intentionally triggering an alarm. While the autodialer identified the alarm, no calls were received. Further troubleshooting found that the autodialer was not connected to the phone line. Wood is currently working with the telecommunications service provider to repair the connection to the phone line.

Despite these operational issues, the target differential water level was maintained during the reporting period. No other problems were encountered during the October 2019 through March 2020 time period.

4.0 Summary and conclusions

4.1 Water levels

Table 3 presents water levels collected during the Round 87 groundwater monitoring event in March 2020. Water levels in wells installed outside the barrier wall are subject to tidal influences, whereas water levels in wells inside the barrier wall show a greater response to groundwater extraction within the wall than to the tidal variations outside the wall.

As shown in Figure 2, the average water levels inside the barrier wall as measured in MW-49 were maintained well below the target 1-foot difference from the water level measured in DM-8. Review of water level data from MW-47, MW-51, MW-52, and MW-53 indicate that the water level differential continued to be maintained during the period when MW-49 had failed. The water levels measured in the remaining monitoring wells (Figures 3 through 11) display typical trends for manual water level readings.

4.2 Discussion of analytical results

The data from Round 87 are generally consistent with past sampling results obtained from the site, including the groundwater monitoring events completed prior to construction of the barrier wall. The analytical results from Round 87 are shown in Table 4, and Sections 4.2.1 through 4.2.3 discuss the constituents historically identified as having the highest concentrations across the site or that were used historically in industrial processes: toluene, arsenic, and copper. Other metals that exceed the PRGs established by EPA (EPA, 2014c) are discussed further in Section 4.2.4. When new site-specific PRGs are submitted by EPA, the data will be re-evaluated to ensure that trend charts include all locations with constituents of concern detected consistently at concentrations exceeding the PRGs.

4.2.1 Toluene

Figures 13 to 19 present trend plots of the toluene concentrations over time since completion of the barrier wall.

All groundwater samples collected from exterior groundwater monitoring wells contained toluene concentrations lower than the toluene screening level of 1,000 micrograms per liter (µg/L) for potable groundwater and 1,280 µg/L for protection of surface water. The highest toluene concentration from an exterior well (outside the barrier wall) during Round 87 was detected in the groundwater sample from exterior well MW-44 at the south side of the site along Slip 6 at a concentration of 291 µg/L (the field duplicate concentration was 304 µg/L). Toluene also was detected in samples from exterior wells MW-43 at a concentration of 168µg/L and MW-45 at a concentration of 0.25 µg/L. There were no toluene detections in groundwater samples for the remaining eight exterior monitoring wells during Round 87.

4.2.2 Total arsenic

Figures 20 to 26 present trend plots of total arsenic concentrations over time since completion of the barrier wall.

Total arsenic concentrations in groundwater samples from the exterior performance monitoring wells during Round 87 were generally low, exceeding the PRG of 8.0 µg/L only in MW-43 at 14.9 µg/L and MW-44 at 10.4 µg/L (the field duplicate concentration was 10.1 µg/L). Arsenic was detected below the PRG in samples collected from all of the remaining exterior wells except for MW-46, at concentrations ranging from 0.650 µg/L in MW-40 to 2.60 µg/L in MW-45.

4.2.3 Total copper

Figures 27 to 33 present the total copper concentrations over time since completion of the barrier wall.

Total copper concentrations in groundwater samples exceeded the PRG of 8.0 µg/L in five of the 11 exterior performance monitoring wells sampled: MW-41 through MW-45. During Round 87, the highest concentration of total copper from an exterior well was detected in MW-44 at 63.1 µg/L (the field duplicate concentration was 61.9 µg/L). The copper concentrations detected in samples from the remaining exterior wells ranged from 2.09 µg/L (MW-38R) to 48.7 µg/L (MW-43).

4.2.4 Other metals

Figures 34 to 40 present the total aluminum concentrations over time since completion of the barrier wall. Total aluminum concentrations in groundwater exceeded the PRG of 87 µg/L in eight of the 11 exterior performance monitoring wells sampled. The highest concentration of total aluminum in exterior wells during Round 87 was 2,290 µg/L in MW-45. The total aluminum concentrations detected in the samples from the remaining wells ranged from 169 µg/L in well MW-38R to 488 µg/L in well MW-42. The reporting limit in the groundwater sample from MW-43 was 1,000 µg/L. As shown in Figures 34 to 40, the total aluminum concentrations in groundwater from exterior wells have generally decreased since installation of the barrier wall.

Figures 41 and 42 present the total chromium concentration over time in groundwater collected from wells DM-5, B1A, MW-43, and MW-44 since completion of the barrier wall. During the Round 87 sampling event, chromium only exceeded the PRG of 100 µg/L in the groundwater from one exterior well, MW-43, at a concentration of 212 µg/L. The total chromium concentrations detected in the remaining exterior wells ranged from 0.967 µg/L in MW-46 to 62.9 µg/L in MW-44 (the field duplicate concentration was 60.3 µg/L). Total chromium has not historically been detected at concentrations above the PRG in any other exterior monitoring wells since installation of the barrier wall.

Figures 43 through 46 present the total lead concentrations over time since completion of the barrier wall. During the Round 87 sampling event, total lead exceeded the PRG of 2.5 µg/L in groundwater from two of the exterior monitoring wells: MW-43 at a concentration of 5.00 µg/L and MW-44 at a concentration of

4.30 µg/L (the field duplicate concentration was 4.21 µg/L). The total lead concentrations detected in the remaining exterior wells ranged from 0.37 µg/L in MW-40 to 1.96 µg/L in MW-45.

Figures 47 through 52 present the total vanadium concentrations over time since completion of the barrier wall. During the Round 87 sampling event, total vanadium exceeded the PRG of 63 µg/L in groundwater collected from exterior monitoring wells MW-41, MW-43, and MW-44 at concentrations ranging from 104 µg/L (MW-41) to 978 µg/L (MW-43). The detections of total vanadium concentrations in the remaining exterior wells ranged from 2.07 µg/L in B1A to 52.4 µg/L in MW-38R.

Other metals with concentrations or reporting limits that exceeded their respective PRGs during the Round 87 monitoring event for which trend charts were not produced are total cadmium, mercury, nickel, selenium, and zinc.

4.3 Compliance with performance standard

The 72-hour average water levels for monitoring wells DM-8 (exterior control well) and MW-49 (interior control well) are shown on Figure 2 for the period from January 1 through March 31, 2020.

The performance standard for the groundwater extraction system as defined in the Performance Monitoring Plan (AMEC Geomatrix, 2009) specifies that the moving 72-hour average water level on the inside of the barrier wall will be maintained at a level greater than or equal to 1 foot lower than the level on the outside of the barrier wall, as measured at wells MW-49 and DM-8. The target water level to be maintained for MW-49 is 1 foot lower than the 72-hour average water level in DM-8. As shown in Figure 2, the water level for MW-49 remained below the target water level throughout the monitoring period from January 1, 2020, through March 31, 2020. During the period in which MW-49 had failed, review of water level data from MW-47, MW-51, MW-52, and MW-53 indicate that the water level differential continued to be maintained.

The groundwater extraction system has been operating under automatic control using input from the transducers installed within the two control wells since January 17, 2006, shortly after moving the pretreatment system to a new building on January 4, 2006. The groundwater extraction system has complied with this performance standard from February 2004 through March 31, 2020.

5.0 References

AGI Technologies, 1999, Tidal Study, Former Rhone-Poulenc Marginal Way Facility, Tukwila, Washington: Prepared for RCI Environmental, Inc., Sumner, Washington, August 20.

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Former Rhone Poulenc Site, Tukwila, Washington: Prepared for Container Properties, LLC, Tukwila, Washington, July.

AMEC Geomatrix, Inc. (AMEC Geomatrix), 2009, Interim Measures Performance Monitoring Plan (Revised): Prepared for Container Properties, LLC, Tukwila, Washington, Revised November 5.

EPA — see U.S. Environmental Protection Agency.

GeoEngineers, 2002, Round 15 Groundwater Monitoring, Former Rhone-Poulenc Site, 9229 East Marginal Way South, Tukwila, Washington: Prepared for RCI Environmental, Inc., Sumner, Washington, April 25.

URS, 2002, Interim Measures Construction Work Plan: Prepared for Container Properties, LLC, Tukwila, Washington, October.

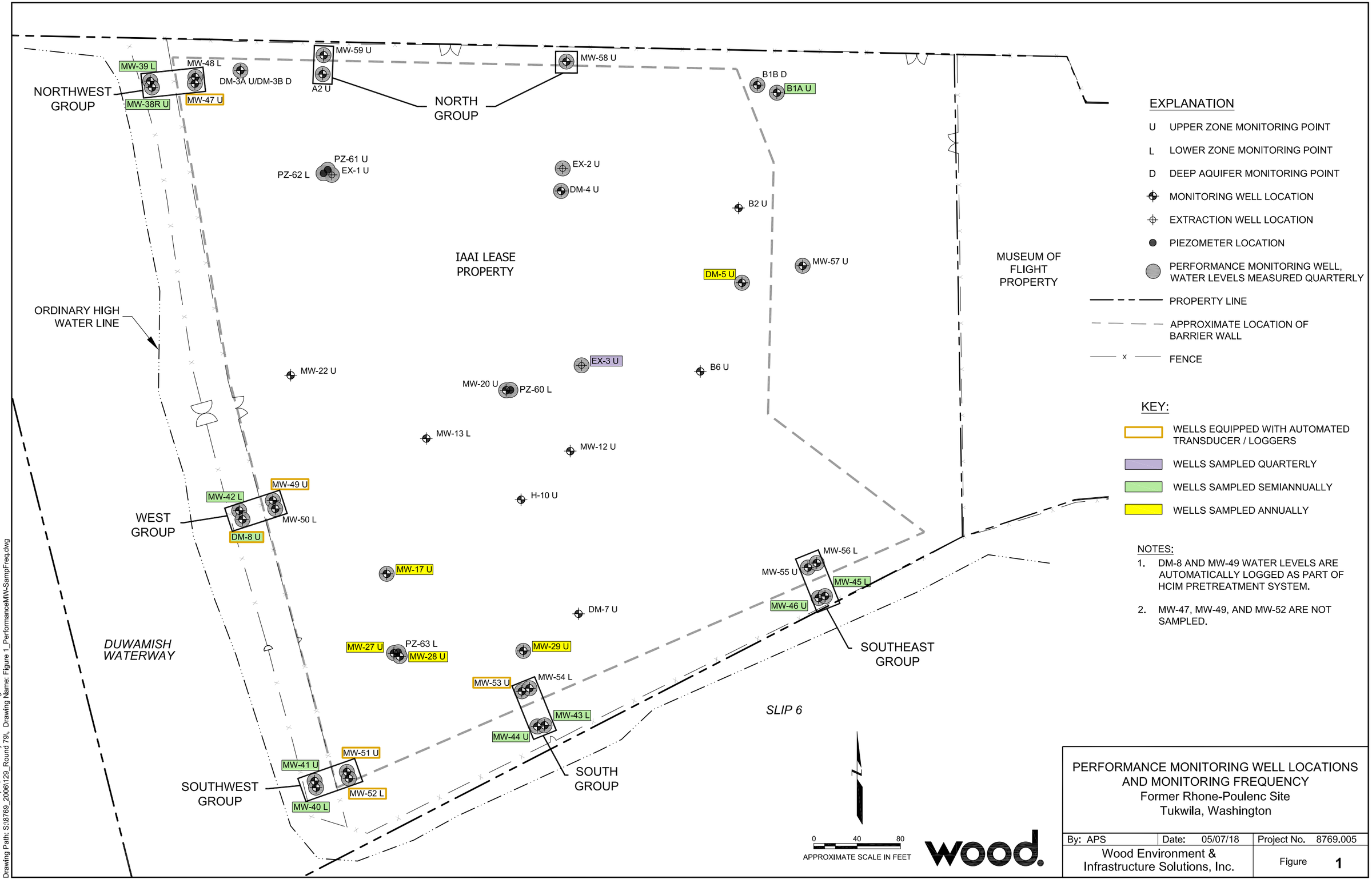
U.S. Environmental Protection Agency (EPA), 1998, Groundwater Sampling Procedure: Low Stress (Low Flow) Purging and Sampling, U.S. Environmental Protection Agency Region II, GW Sampling SOP, Final, March 16.

———, 2014a, U.S. EPA National Functional Guidelines for Superfund Organic Methods Data Review: EPA 540-R-014-002, August.

———, 2014b, U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review: EPA 540-R-08-01, January.

———, 2014c, Preliminary Remediation Goals for Rhone-Poulenc Inc., Marginal Way Facility, West Parcel, Tukwila, Washington, WAD 00928 2302, March 17.

Figures

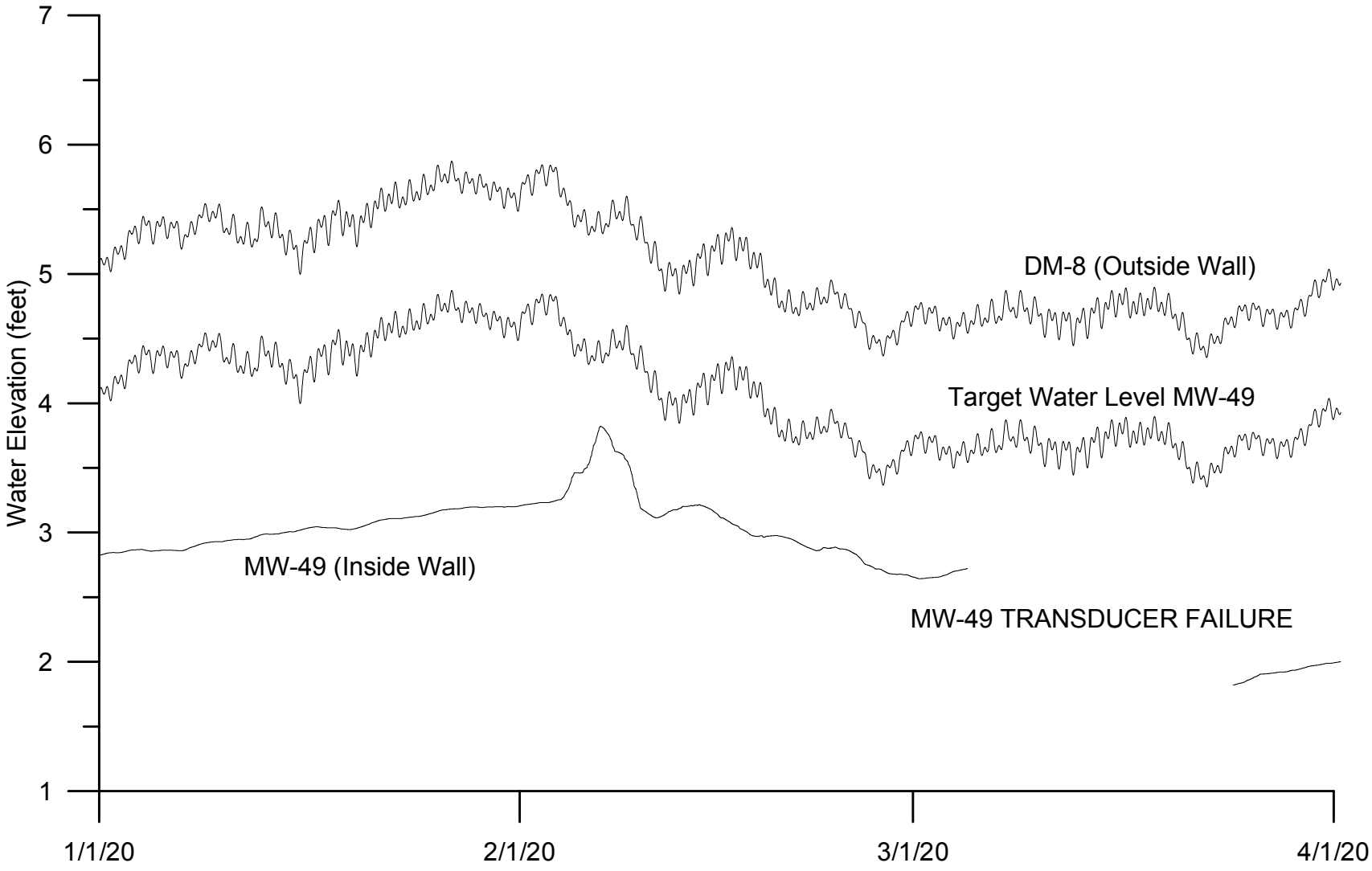


Plot Date: 05/07/18 - 4:48pm, Plotted by: adam.stenberg
Drawing Path: S:\8769_2006\29_Round 79\, Drawing Name: Figure 1_PerformanceMW-SampFreq.dwg

PERFORMANCE MONITORING WELL LOCATIONS AND MONITORING FREQUENCY
Former Rhone-Poulenc Site
Tukwila, Washington

By: APS	Date: 05/07/18	Project No. 8769.005
Wood Environment & Infrastructure Solutions, Inc.		Figure 1

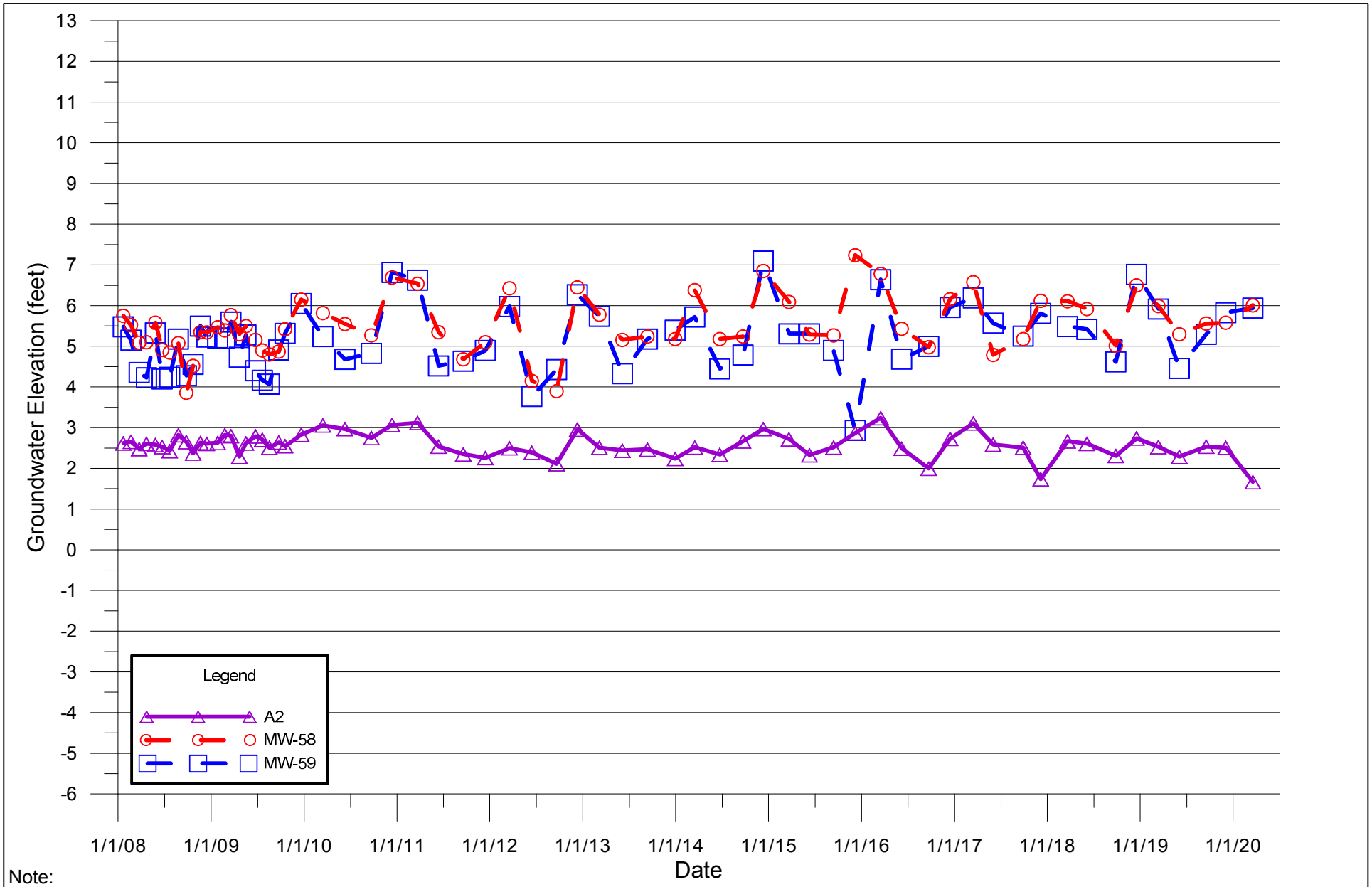
P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Water Level Figures and Data\SAR Fig 2.grf



Notes: 1. Vertical datum is North American Vertical Datum of 1988.
2. Average water level based on a 72-hour moving average as recorded using transducers and on-site programmable logic controller.

wood.	PERFORMANCE MONITORING AVERAGE WATER LEVELS, DM-8 AND MW-49 JANUARY THROUGH MARCH 2020 Former Rhone-Poulenc Site, Tukwila, Washington	Project No. 8769 Figure No. 2

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Water Level Figures and Data\SAR Fig 3 O&M B-1.grf



Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wal
3. Hollow Points = Upper Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: A2, MW-58, AND MW-59
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
3

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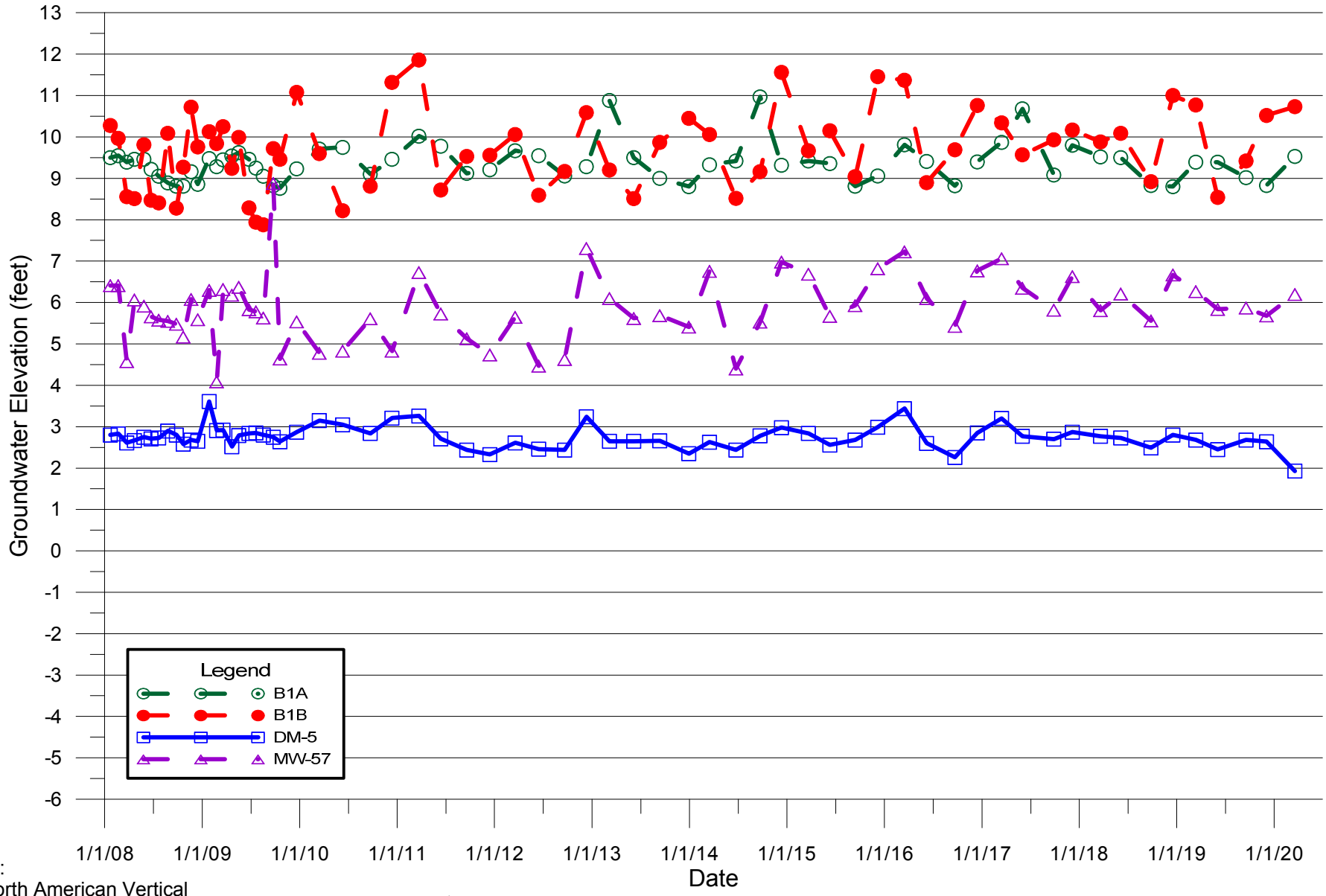

Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: B1A, B1B, DM-5, AND MW-57
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
4

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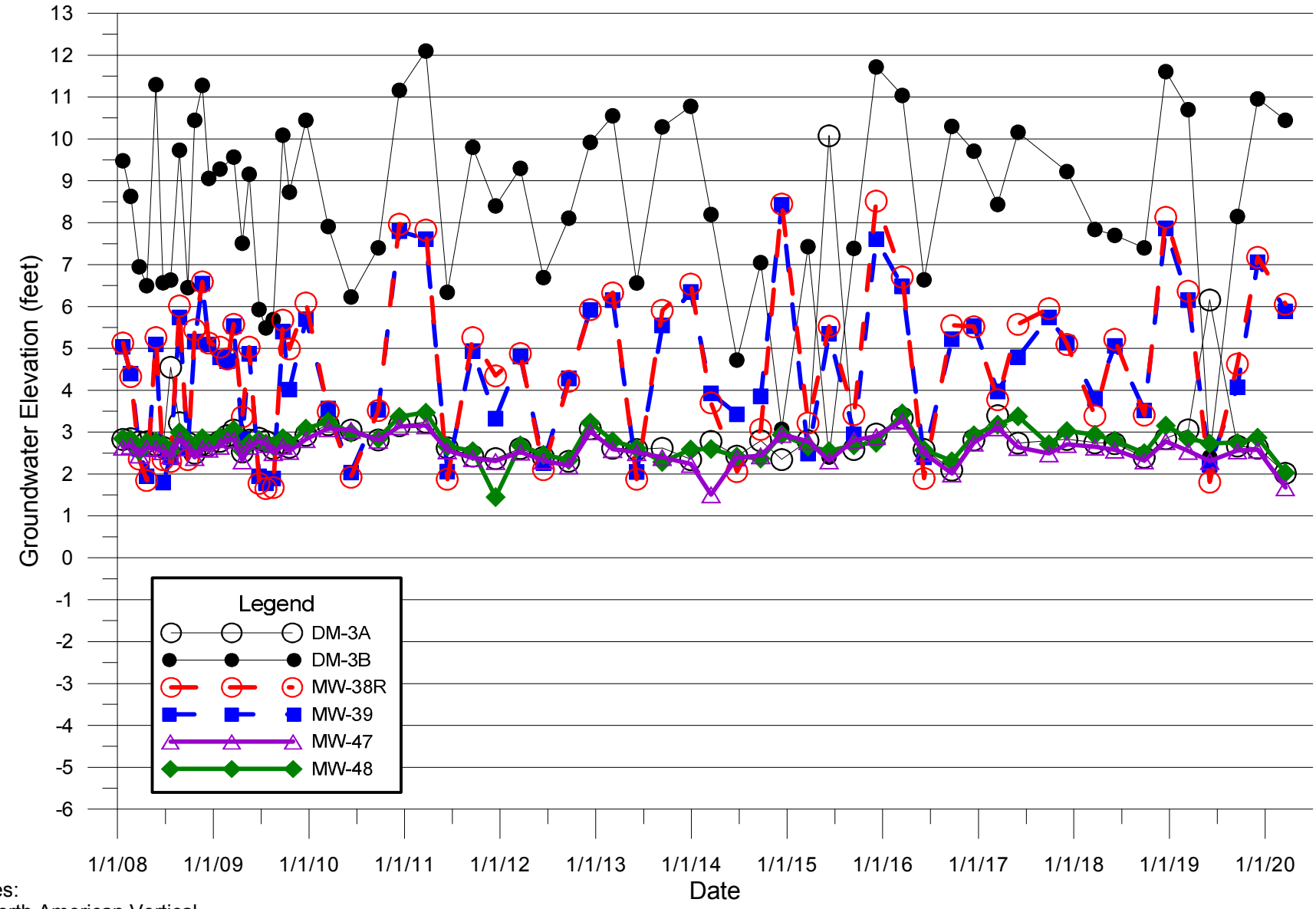

Notes:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS:
DM-3A, DM-3B, MW-38R, MW-39, MW-47, AND MW-48
Former Rhone-Poulenc Site, Tukwila, Washington

Project No.
8769

Figure No.
5

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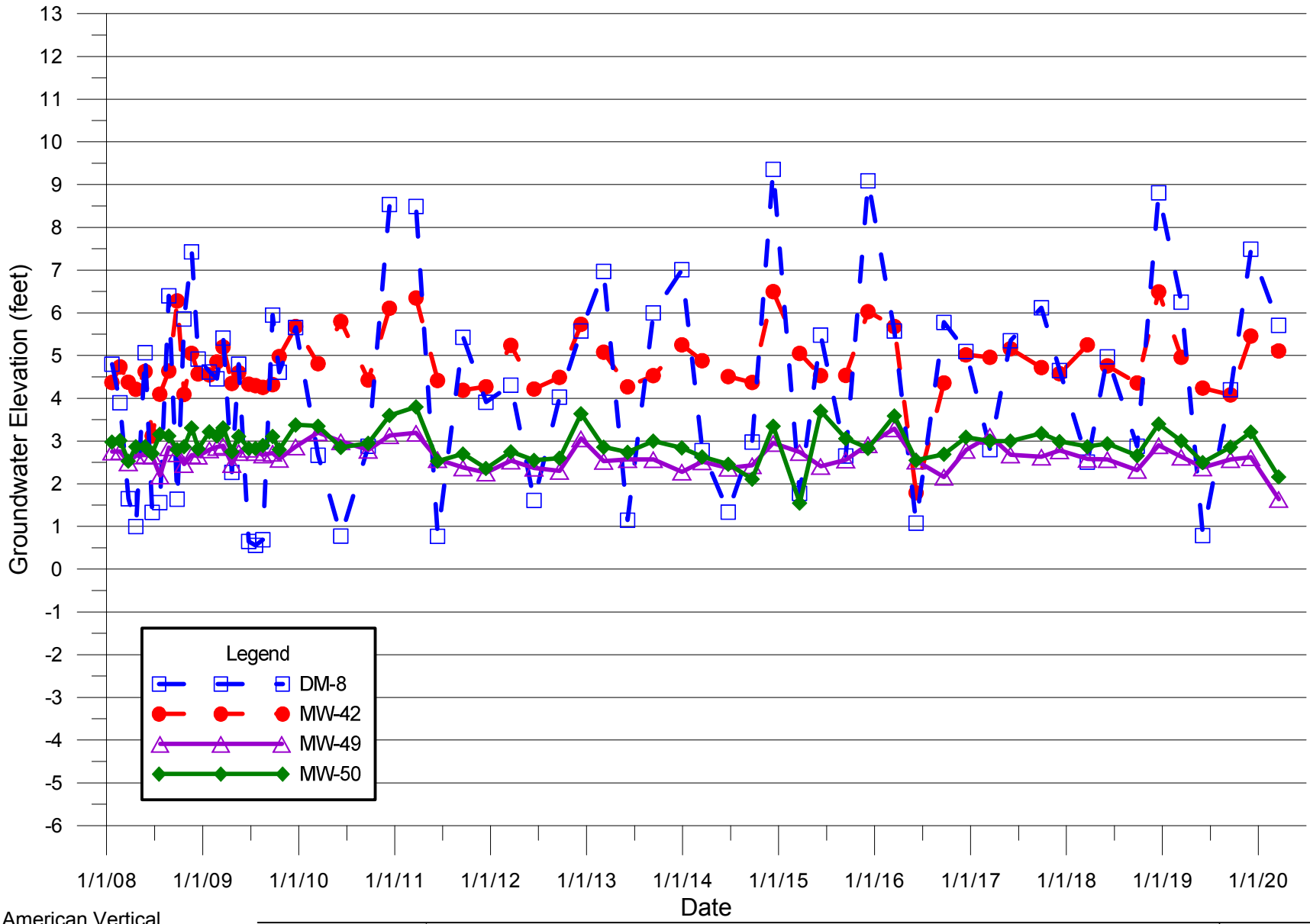

Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: DM-8, MW-42, MW-49, AND MW-50
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
6

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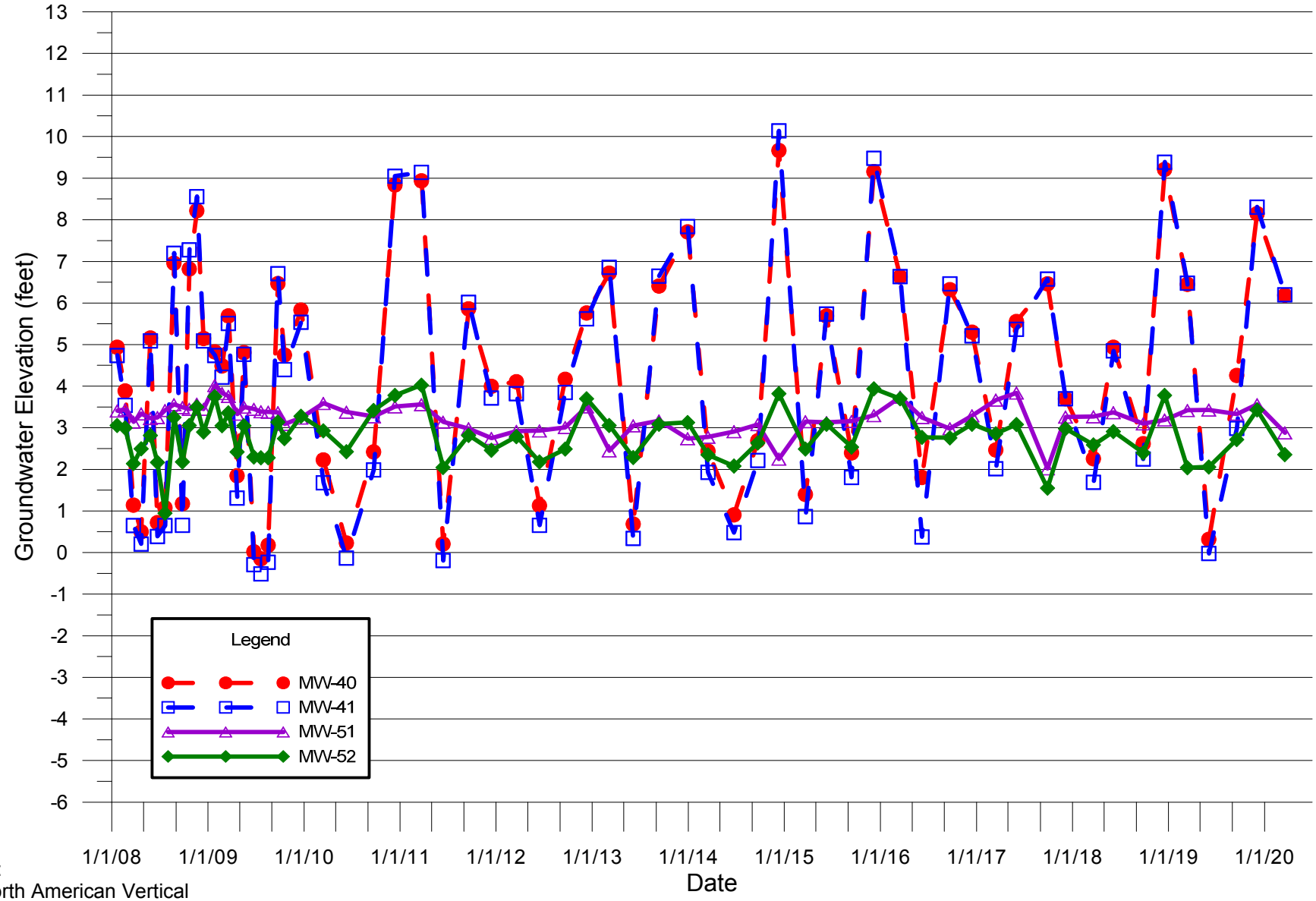

Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: MW-40, MW-41, MW-51, AND MW-52
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
7

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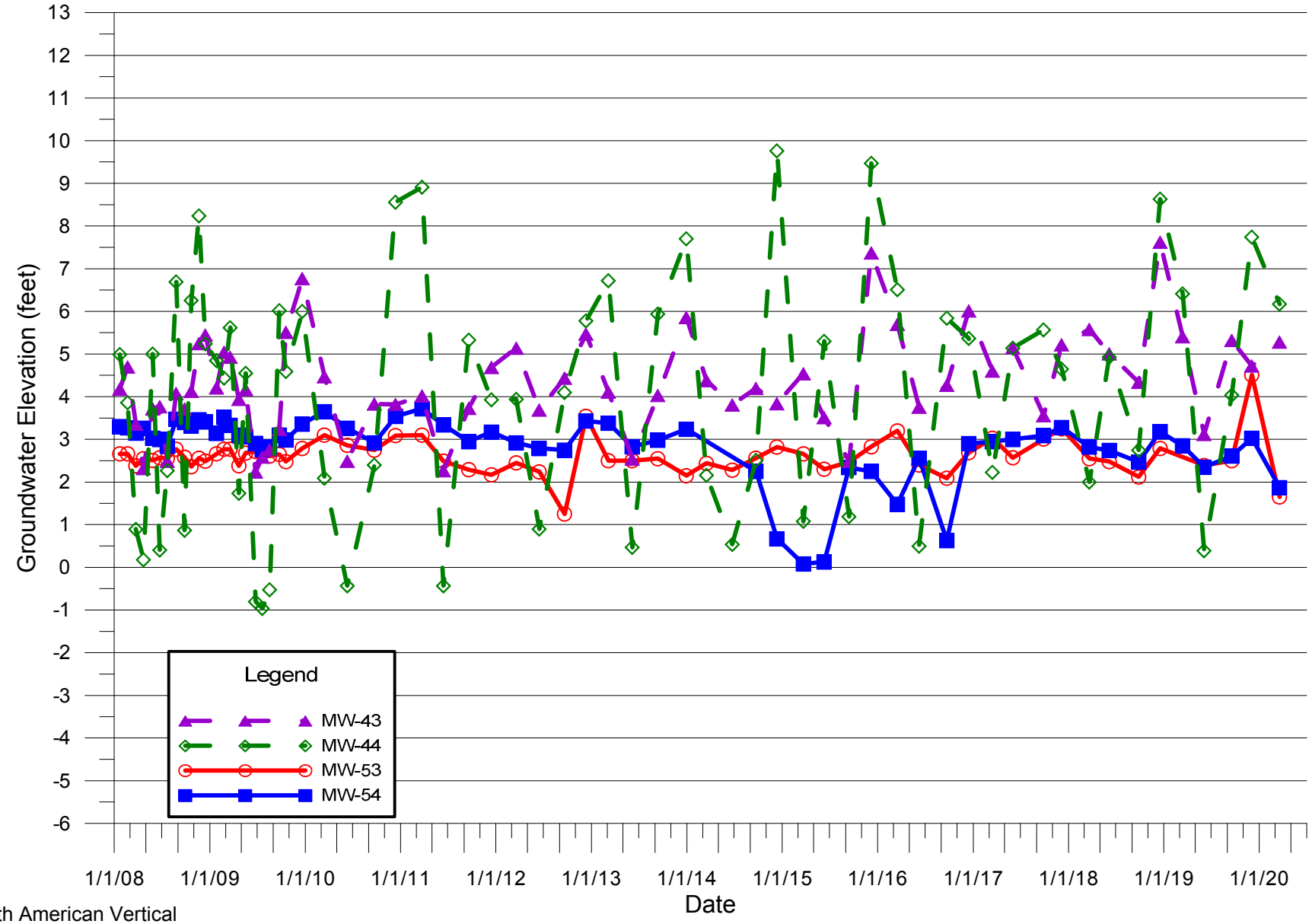

Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: MW-43, MW-44, MW-53, AND MW-54
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
8

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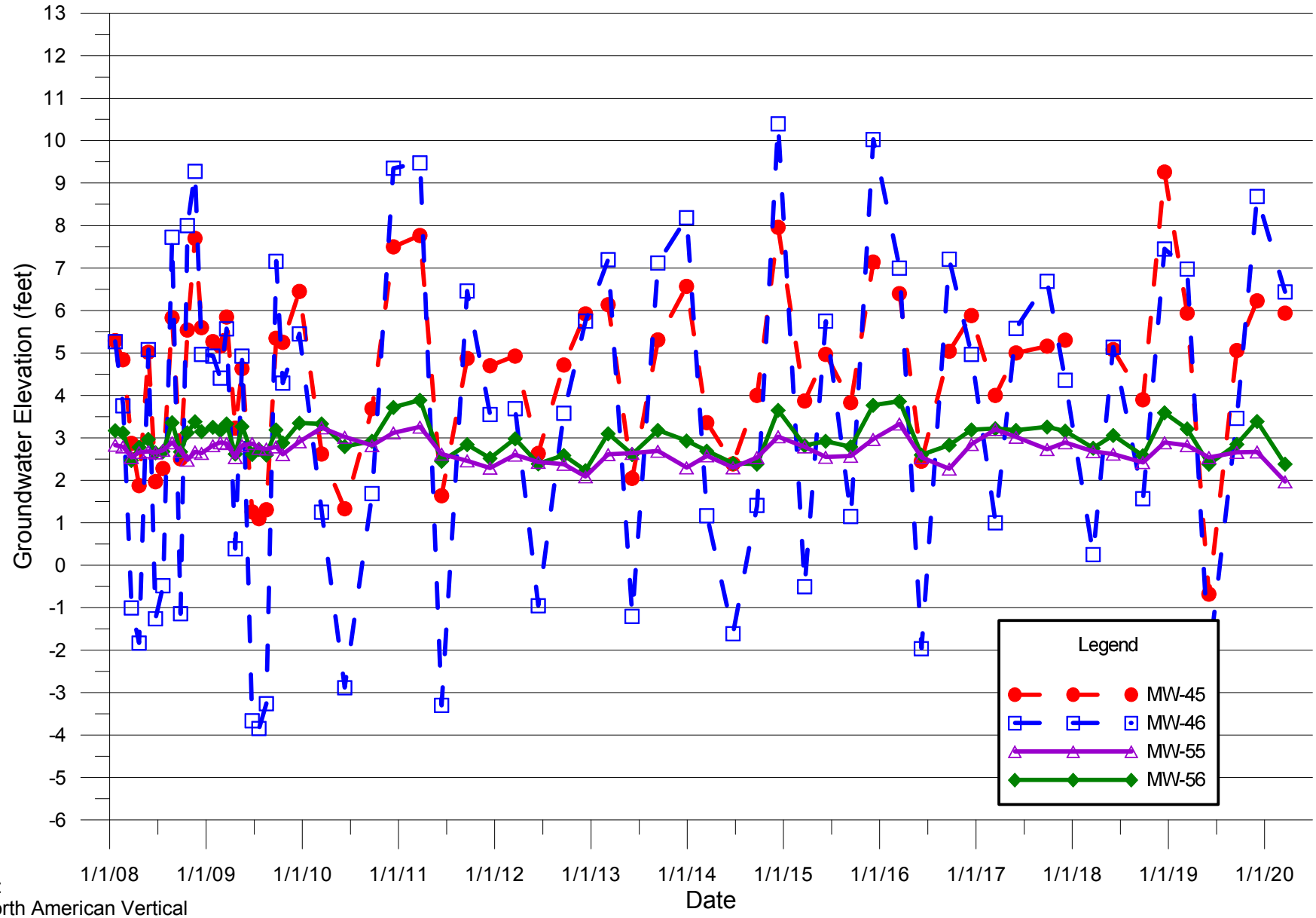

Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS: MW-45, MW-46, MW-55, AND MW-56
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
9

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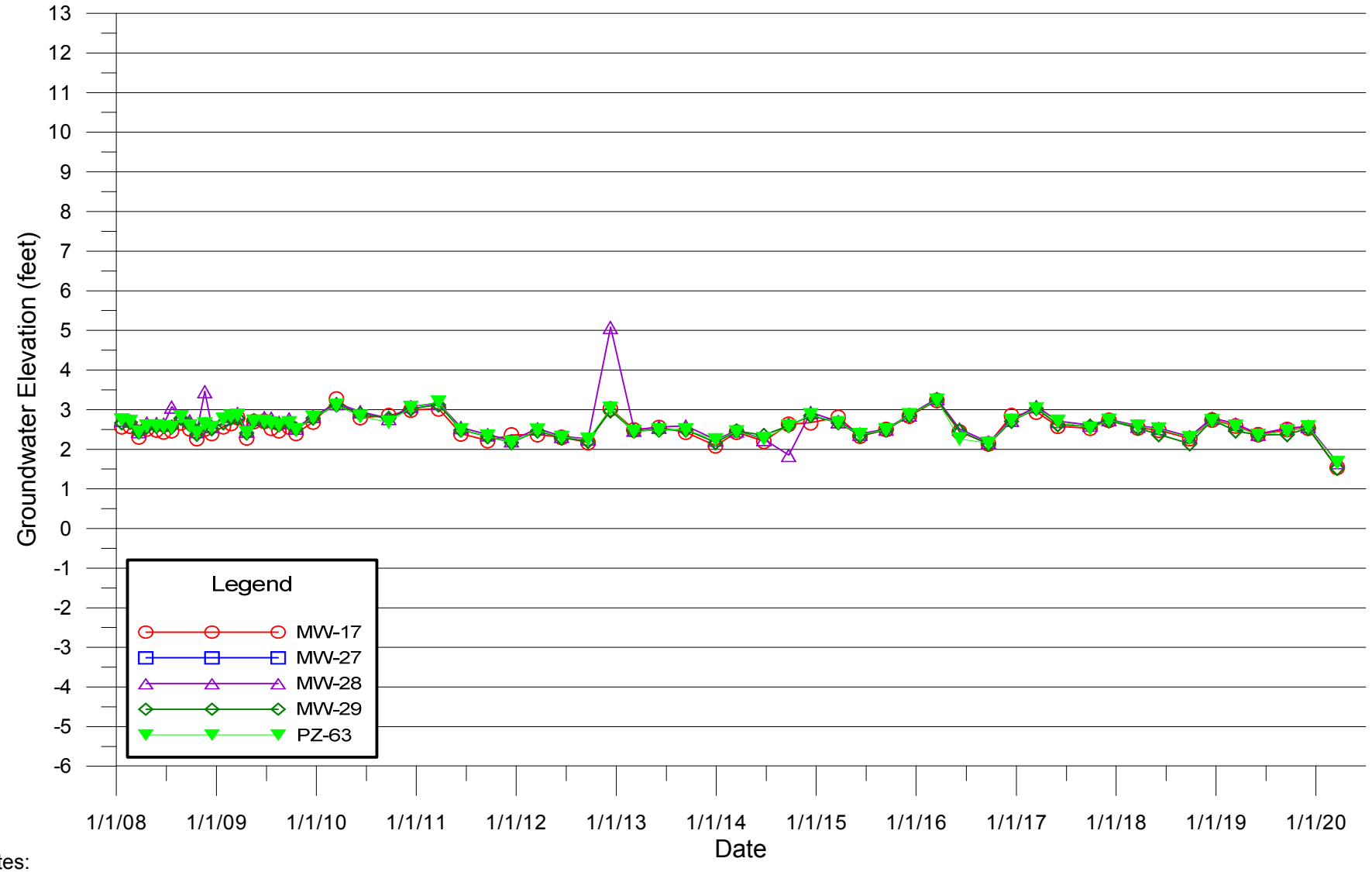


Notes:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well
5. MW-27 has not been measured since April 2007 due to an obstruction.

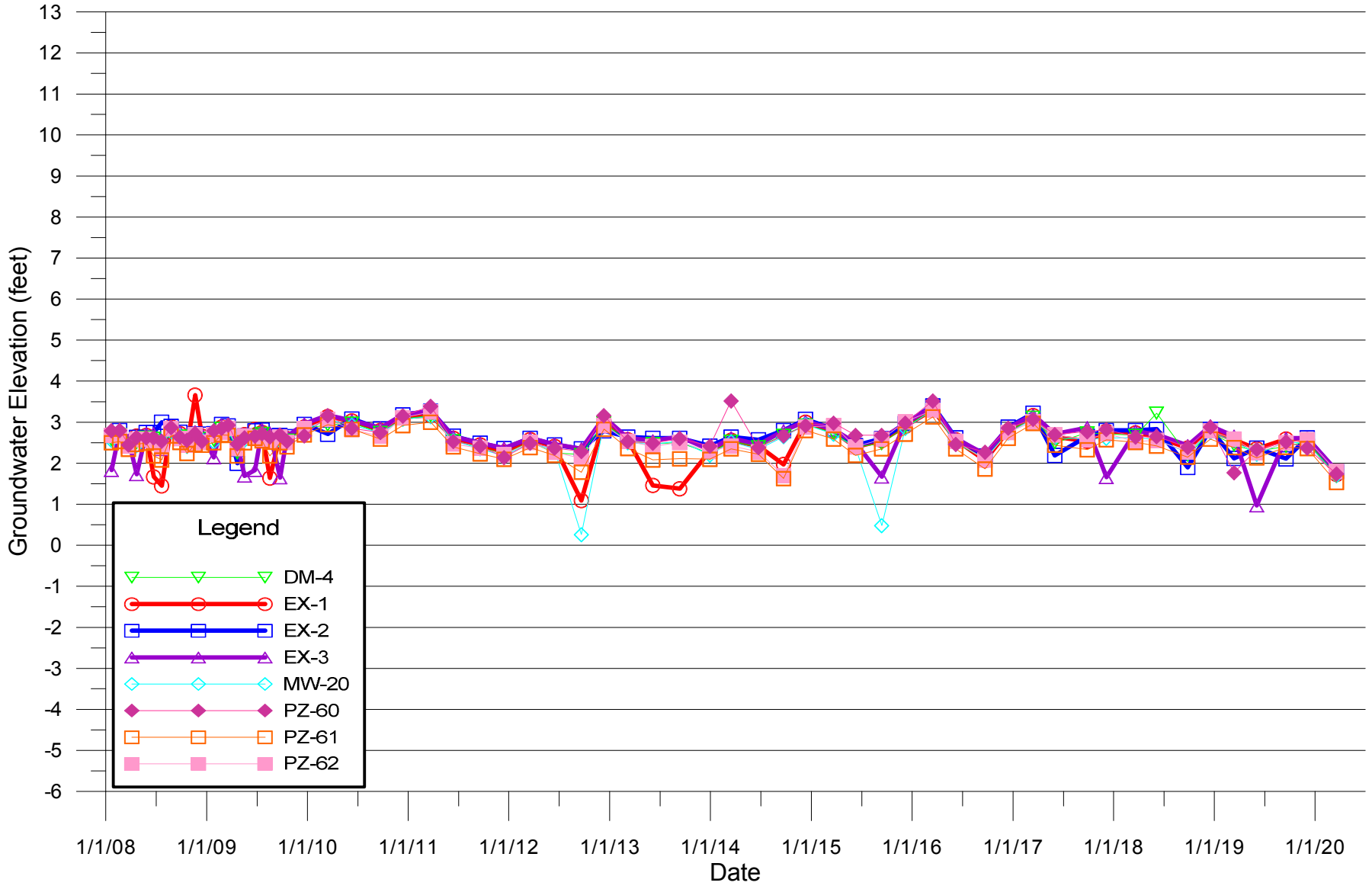
wood.

GROUNDWATER ELEVATIONS: MW-17, MW-27, MW-28, MW-29, AND PZ-63
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
10

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Water Level Figures and Data\SAR Fig 11 O&M B-9.grf



Note:
1. North American Vertical Datum of 1988.
2. Dashed line indicates well located outside of barrier wall.
3. Hollow Points = Upper Aquifer Zone Well
4. Solid Points = Lower Aquifer Zone Well

wood.

GROUNDWATER ELEVATIONS:
DM-4, EX-1, EX-2, EX-3, MW-20, PZ-60, PZ-61, AND PZ-62
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
11

MW-39	
Toluene	0.20 U
Copper	6.72 J+
Arsenic	1.85
pH	7.46

MW-38R	
Toluene	0.20 U
Copper	2.09 J+
Arsenic	2.21
pH	6.70

MW-42	
Toluene	0.20 U
Copper	**8.51**
Arsenic	1.99
pH	7.70

DM-8	
Toluene	0.20 U
Copper	1.00 U
Arsenic	0.808
pH	6.71

MW-41	
Toluene	0.20 U
Copper	**19.1**
Arsenic	2.22
pH	10.02

MW-40	
Toluene	0.20 U
Copper	3.65 J+
Arsenic	0.650
pH	7.96

EX-3	
Toluene	0.20 U
Copper	**21.5**
Arsenic	3.93
pH	6.71

MW-44		FD
Toluene	291	304
Copper	**63.1**	**61.9**
Arsenic	**10.4**	**10.1**
pH	11.17	11.17

MW-43	
Toluene	168
Copper	**48.7**
Arsenic	**14.9**
pH	11.14

B1A	
Toluene	0.20 U
Copper	1.00 U
Arsenic	0.802
pH	6.74

MW-45	
Toluene	0.25
Copper	**13.4 J+**
Arsenic	2.60
pH	7.46

MW-46	
Toluene	0.20 U
Copper	1.00 U
Arsenic	0.400 U
pH	6.44

Groundwater Pretreatment Building

NORTH CLUSTER

NORTHWEST CLUSTER

WEST CLUSTER

SOUTHWEST CLUSTER

SOUTH CLUSTER

SOUTHEAST CLUSTER

IAAI LEASE PROPERTY

MUSEUM OF FLIGHT PROPERTY

SLIP 6

DUWAMISH WATERWAY

SHORELINE

MW-39 L, MW-38R U, MW-47 U, MW-48 L, DM-3A U/ DM-3B D, A2 U, MW-59 U, MW-58 U, B1B D, B1A U, PZ-61 U, PZ-62 L, EX-1 U, EX-2 U, DM-4 U, B2 U, DM-5 U, MW-57 U, EX-3 U, MW-22 U, MW-20 U, PZ-60 L, B6 U, MW-13 L, MW-12 U, MW-42 L, MW-49 U, MW-50 L, DM-8 U, MW-17 U, DM-7 U, MW-27 U, PZ-63 L, MW-28 U, MW-29 U, MW-53 U, MW-54 L, MW-44 U, MW-43 L, MW-41 U, MW-51 U, MW-52 L, MW-40 L, MW-56 L, MW-55 U, MW-45 L, MW-46 U

EXPLANATION

- U UPPER ZONE MONITORING POINT
- L LOWER ZONE MONITORING POINT
- D DEEP AQUIFER MONITORING POINT
- MONITORING WELL LOCATION
- EXTRACTION WELL LOCATION
- PIEZOMETER LOCATION
- PROPERTY LINE
- APPROXIMATE LOCATION OF BARRIER WALL
- X FENCE

KEY

MW-46		
Toluene	0.20 U	TOLUENE IN µg/L
Copper	1.00 U	TOTAL COPPER IN µg/L
Arsenic	0.400 U	TOTAL ARSENIC IN µg/L
pH	6.44	pH IN STANDARD UNITS

NOTES

"U" INDICATES ANALYTE NOT DETECTED ABOVE REPORTING LIMIT INDICATED.

"J+" INDICATES VALUE IS ESTIMATED; RESULT IS BIASED HIGH.

FIELD pH MEASUREMENTS PRESENTED.

µg/L = MICROGRAMS PER LITER

FD = FIELD DUPLICATE

BOLD INDICATES ANALYTE WAS ABOVE THE PRG.

N

0 50 100

APPROXIMATE SCALE IN FEET

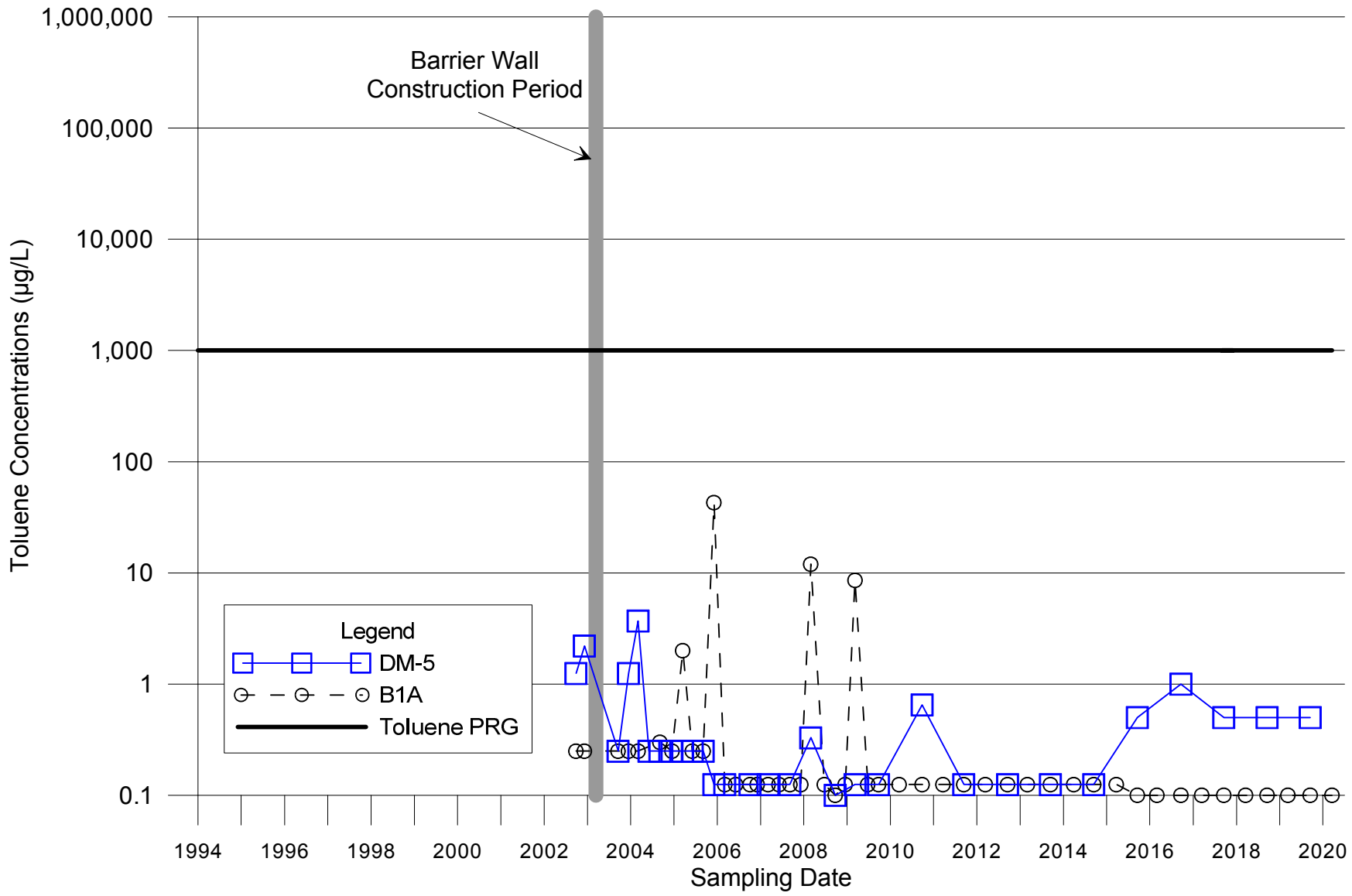
ROUND 87
GROUNDWATER MONITORING RESULTS
MARCH 2020
Former Rhone-Poulenc Site
Tukwila, Washington

By: MDS	Date: 05/12/20	Project No. 0087690050
Wood Environment & Infrastructure Solutions, Inc.	Figure 12	

wood.

Plot Date: 05/12/20 - 6:06pm, Plotted by: mike stenberg
Drawing Path: C:\Users\mike.stenberg\Desktop\Civil 3D Projects\Wood\FRP\Fig 12 R87\, Drawing Name: R87_GW-MonitoringResults Mar2020_recover.dwg

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 13 O&M D-15.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Toluene PRG for protection of potable groundwater is 1,000 µg/L; the PRG for BIA is 1,280 µg/L. The more conservative Toluene PRG is shown on this figure.
3. Dashed line indicates well located outside barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

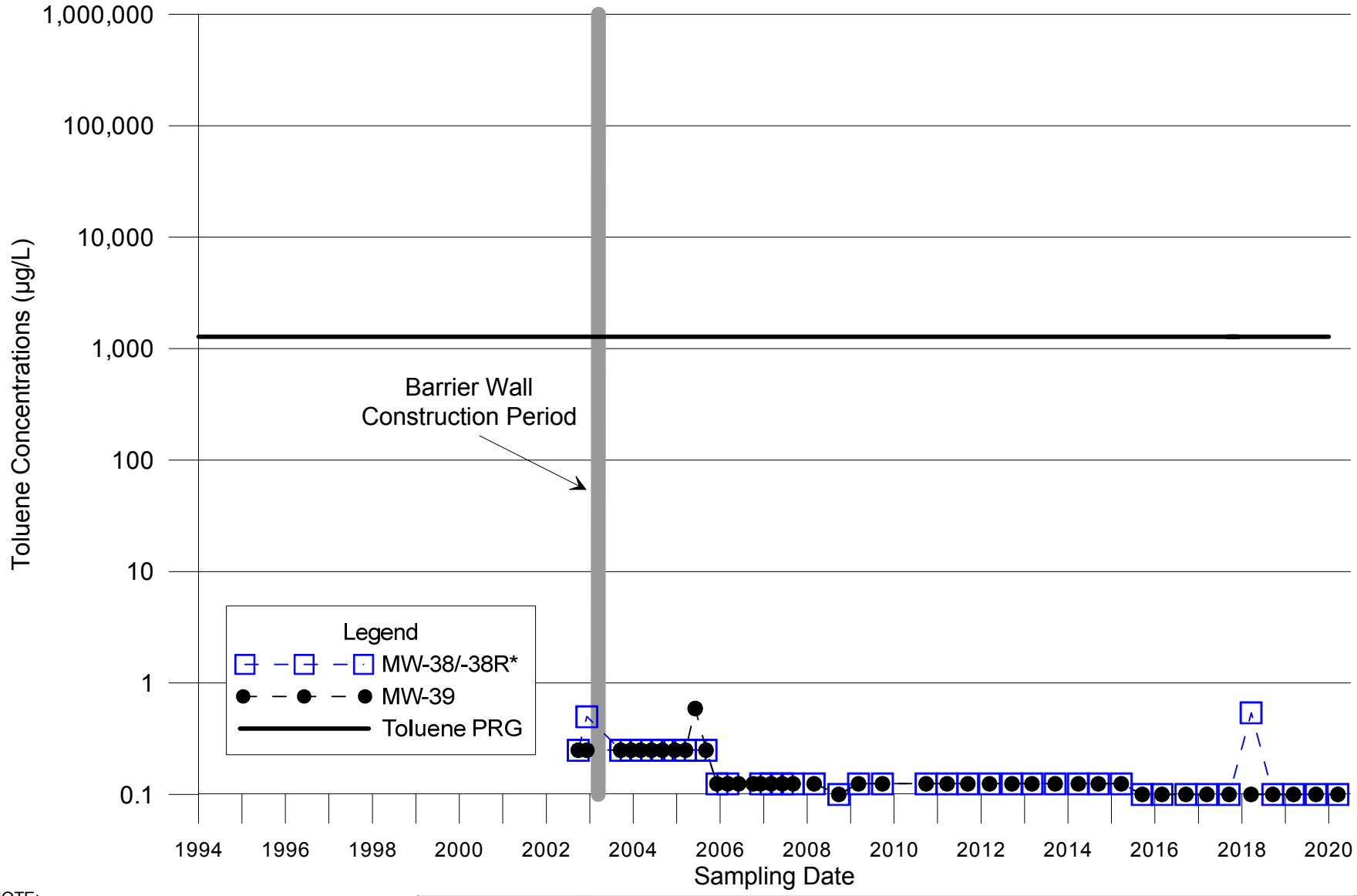
wood.

TOLUENE CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 13

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 14 O&M D-16.grf



NOTE:
1. MW-38 was replaced by MW-38R in October 2006.
2. One-half the reporting limit was used for nondetect values.
3. The Toluene PRG for groundwater protective of surface water is 1,280 µg/L.
4. Dashed line indicates well located outside barrier wall.
5. Hollow Points = Upper Aquifer Zone Well6.
   Solid Points = Lower Aquifer Zone Well
7. PRG= Preliminary Remediation Goal

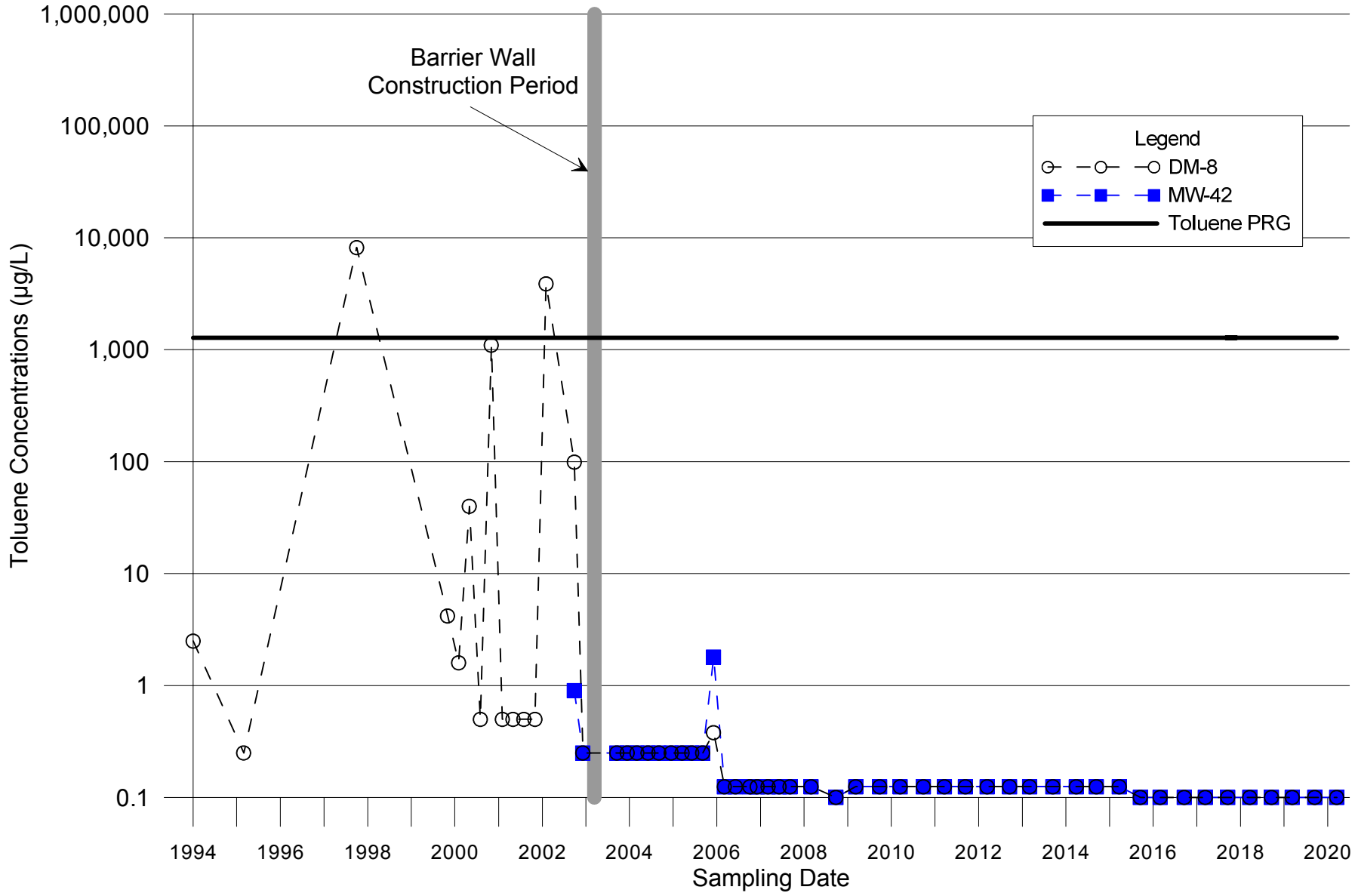
wood.

TOLUENE CONCENTRATIONS VS. TIME: MW-38/-38R AND MW-39
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 14

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 15 O&M D-17.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Toluene PRG level for groundwater protective of surface water is 1,280 µg/L.
3. Dashed line indicates well located outside barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG=Preliminary Remediation Goal

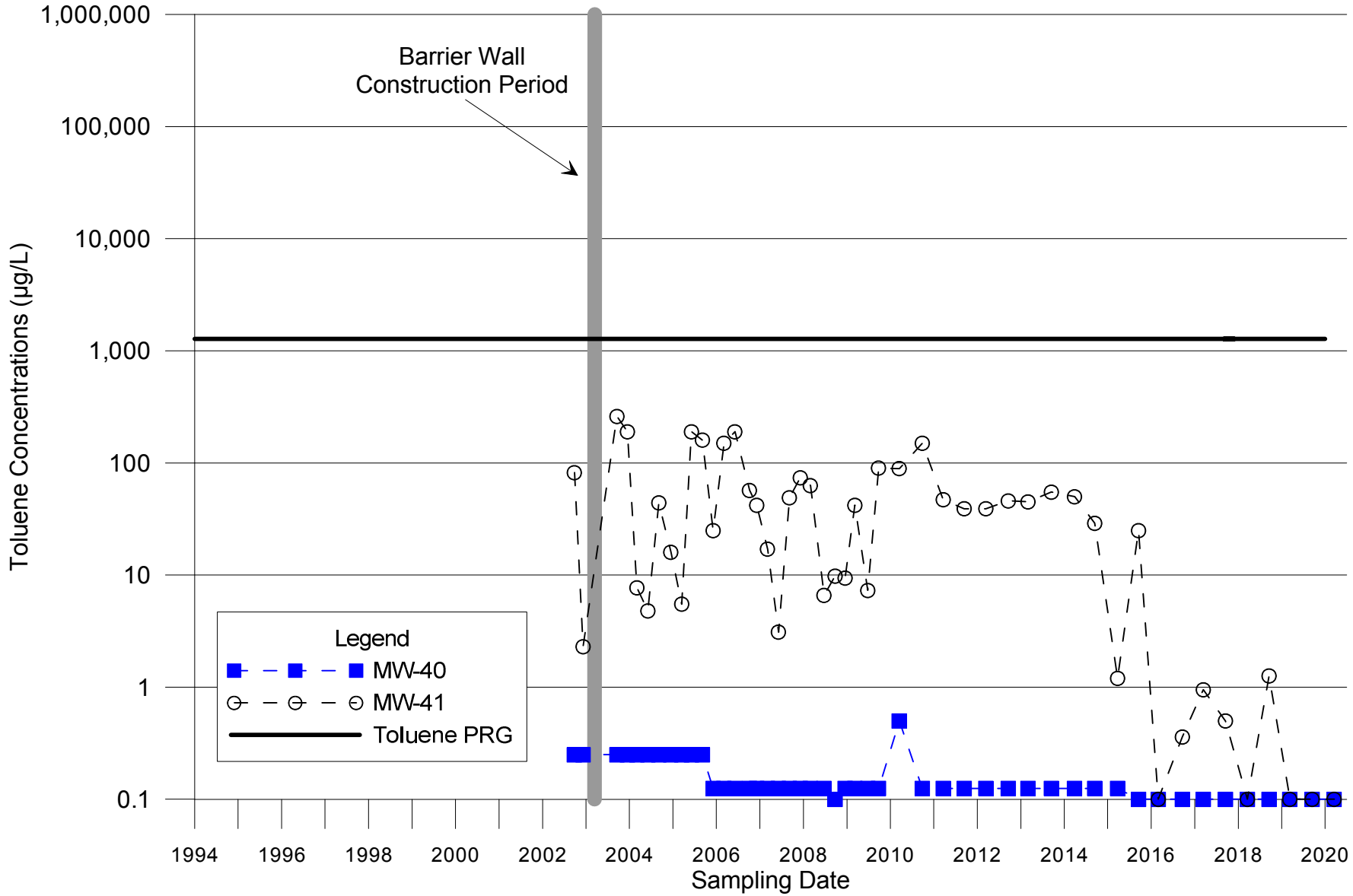
wood.

TOLUENE CONCENTRATIONS VS. TIME: DM-8 AND MW-42
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 15

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 16 O&M D-18.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Toluene PRG level for groundwater protective of surface water is 1,280 µg/L.
3. Dashed line indicates well located outside barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goal

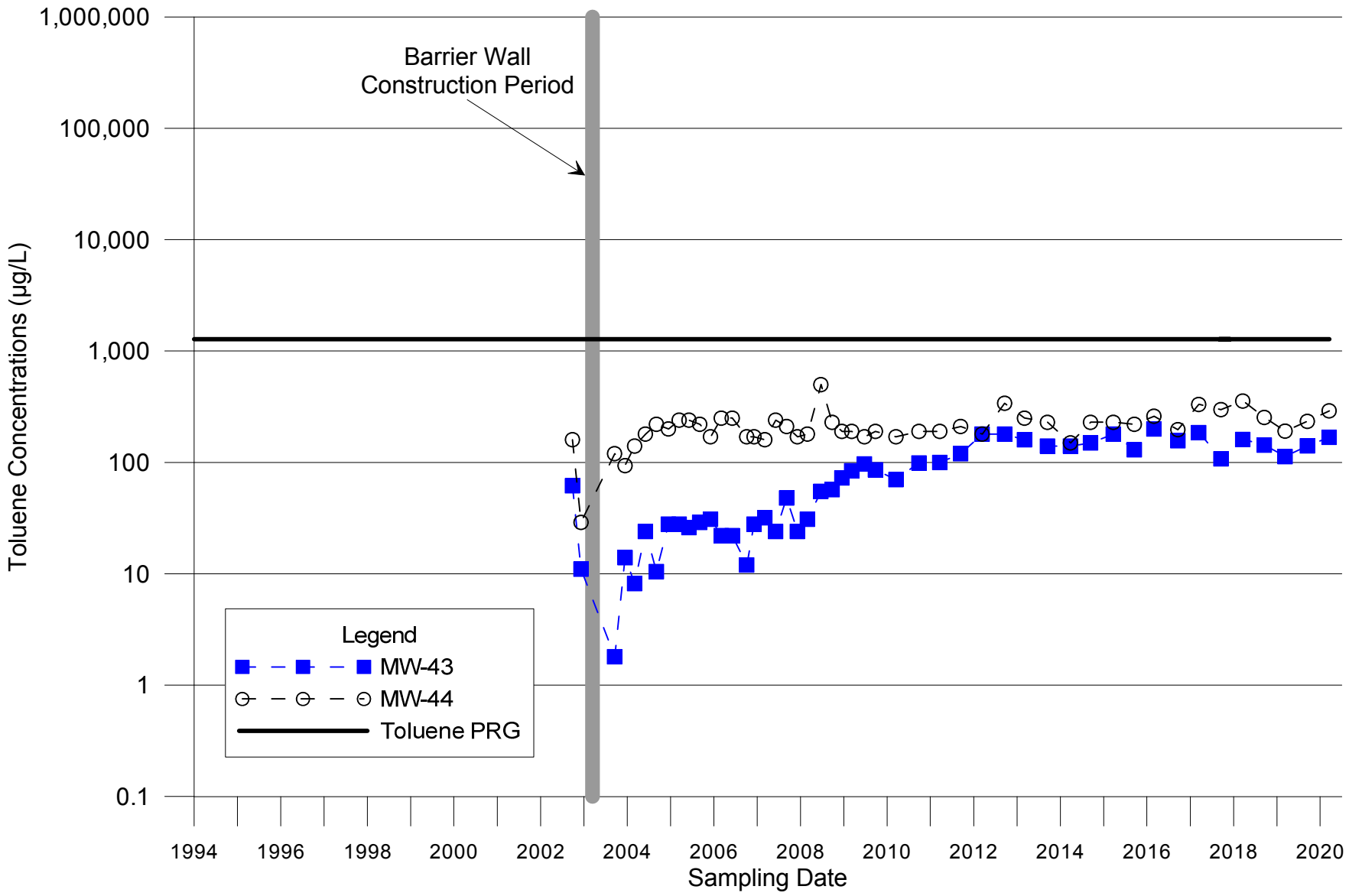
wood.

TOLUENE CONCENTRATIONS VS. TIME: MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 16

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 17 O&M D-19.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Toluene PRG level for groundwater protective of surface water is 1,280 µg/L.
3. Dashed line indicates well located outside barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

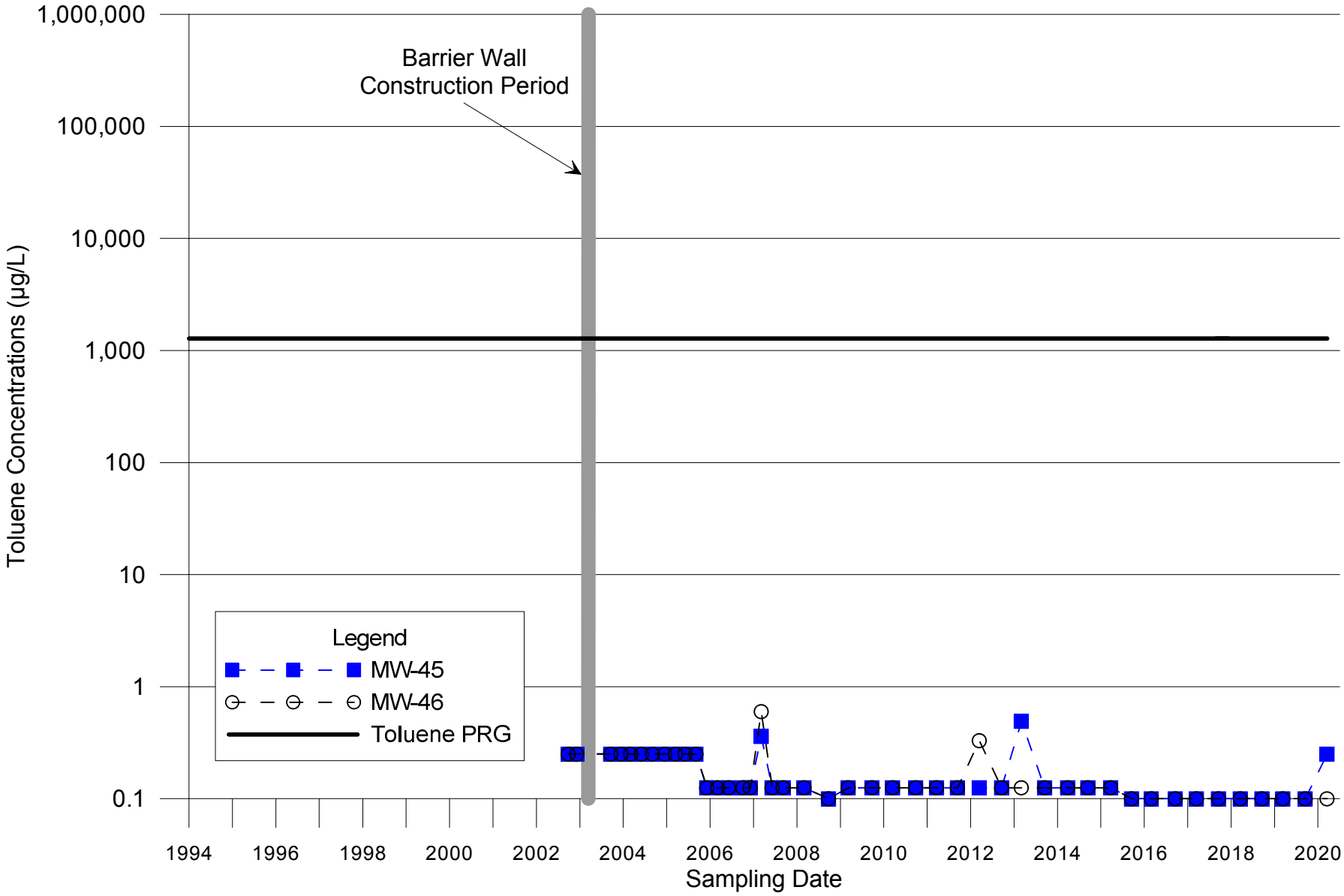
wood.

TOLUENE CONCENTRATIONS VS. TIME: MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 17

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 18 O&M D-20.grf



NOTE:
1. One-half the reporting limit was used for nondetect values
2. The Toluene PRG for groundwater protective of surface water is 1,280 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

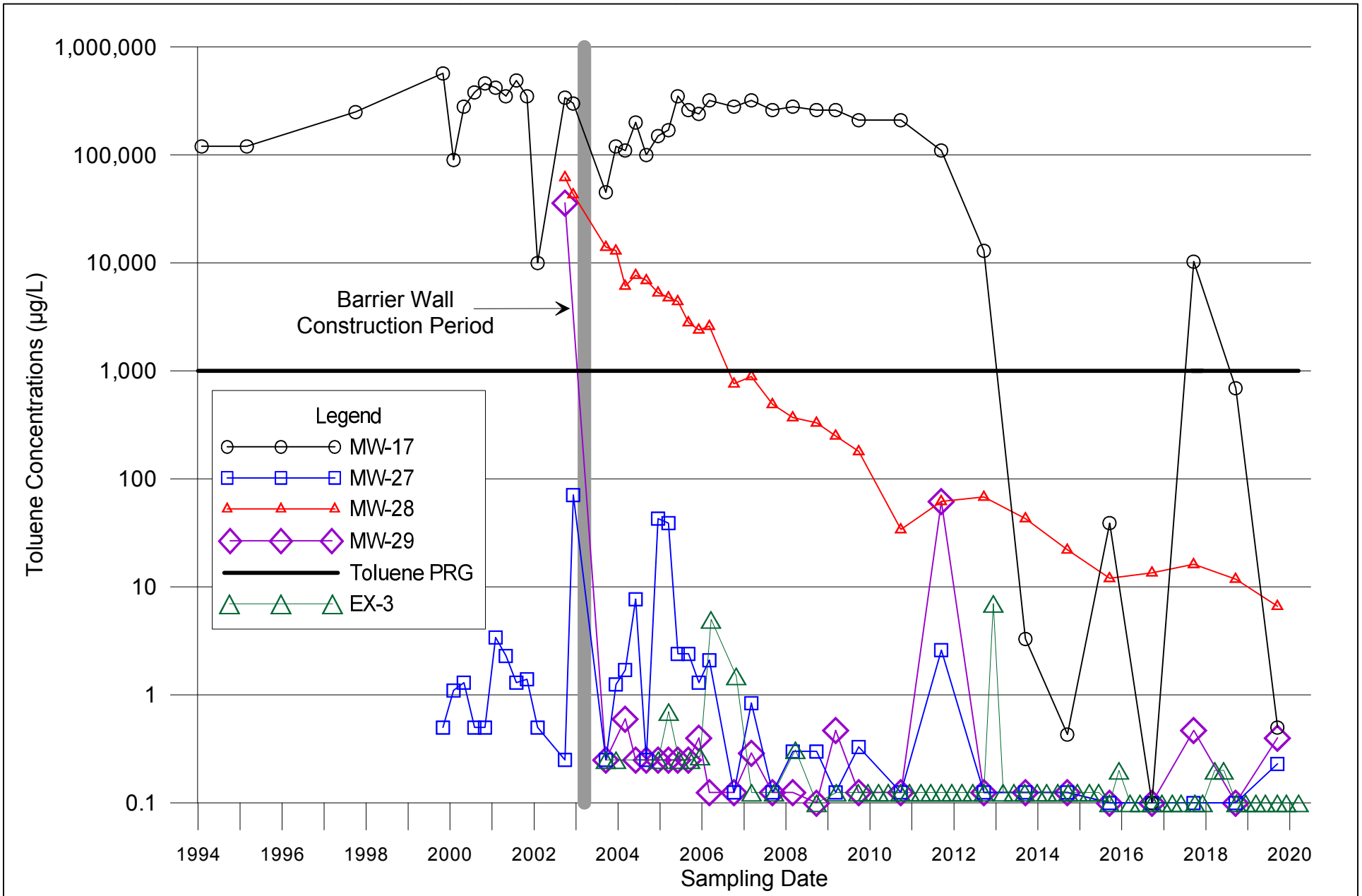
wood.

TOLUENE CONCENTRATIONS VS. TIME: MW-45 AND MW-46
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 18

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 19 O&M D-21.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Toluene PRG for potable groundwater is 1,000 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

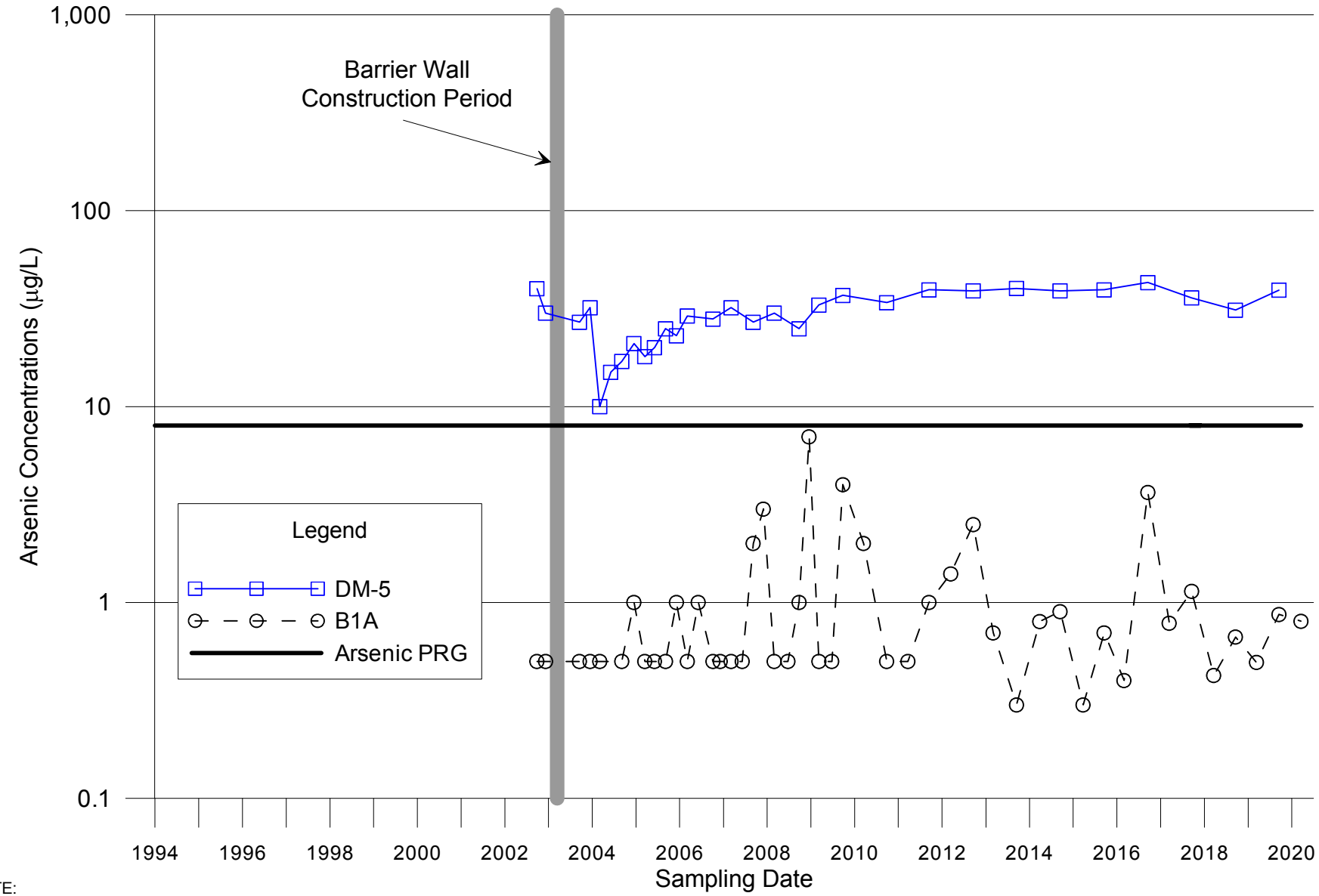
wood.

TOLUENE CONCENTRATIONS VS. TIME: MW-17, MW-27, MW-28, AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 19

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 20 O&M D-8.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

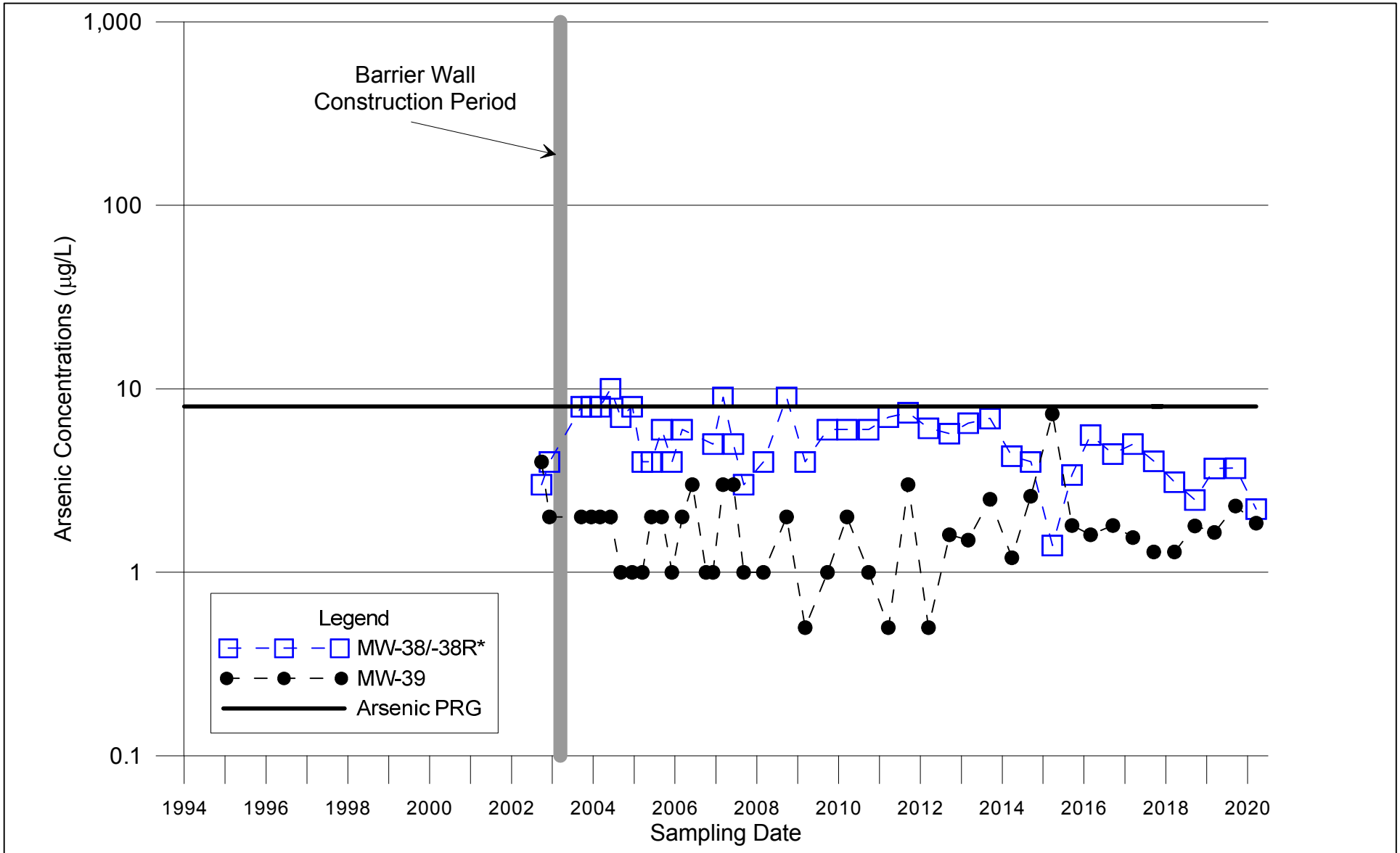
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 20

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 21 O&M D-9.grf



NOTE:
1. MW-38 was replaced by MW-38R in October 2006.
2. One-half the reporting limit was used for nondetect values.
3. The Arsenic PRG for groundwater is 8.0 µg/L.
4. Dashed line indicates well located outside of barrier wall.
5. Hollow Points = Upper Aquifer Zone Well
6. Solid Points = Lower Aquifer Zone Well
7. PRG= Preliminary Remediation Goals

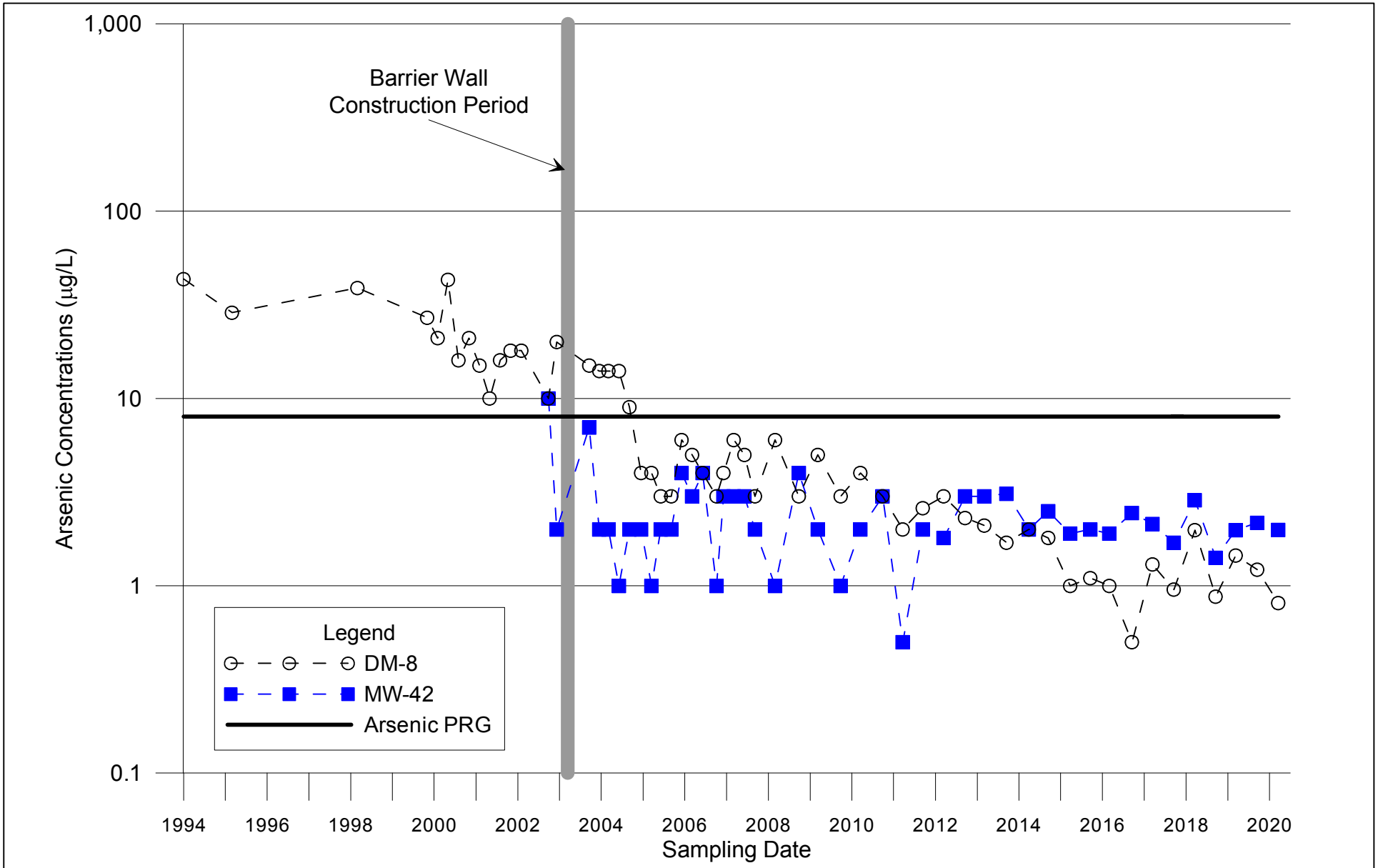
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME:
MW-38/-38R AND MW-39
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
21

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 22 O&M D-10.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

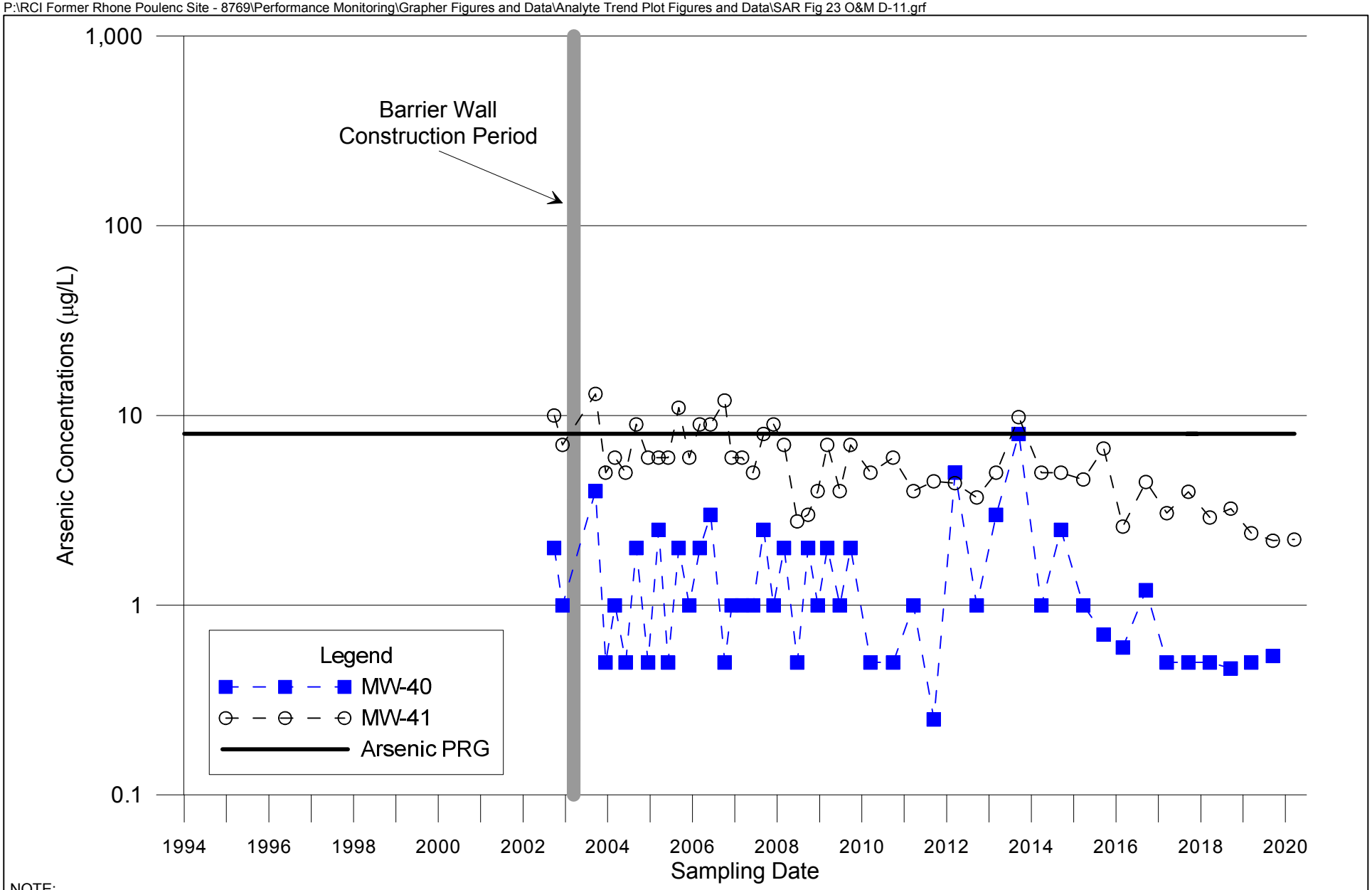
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME: DM-8 AND MW-42
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 22

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 23 O&M D-11.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

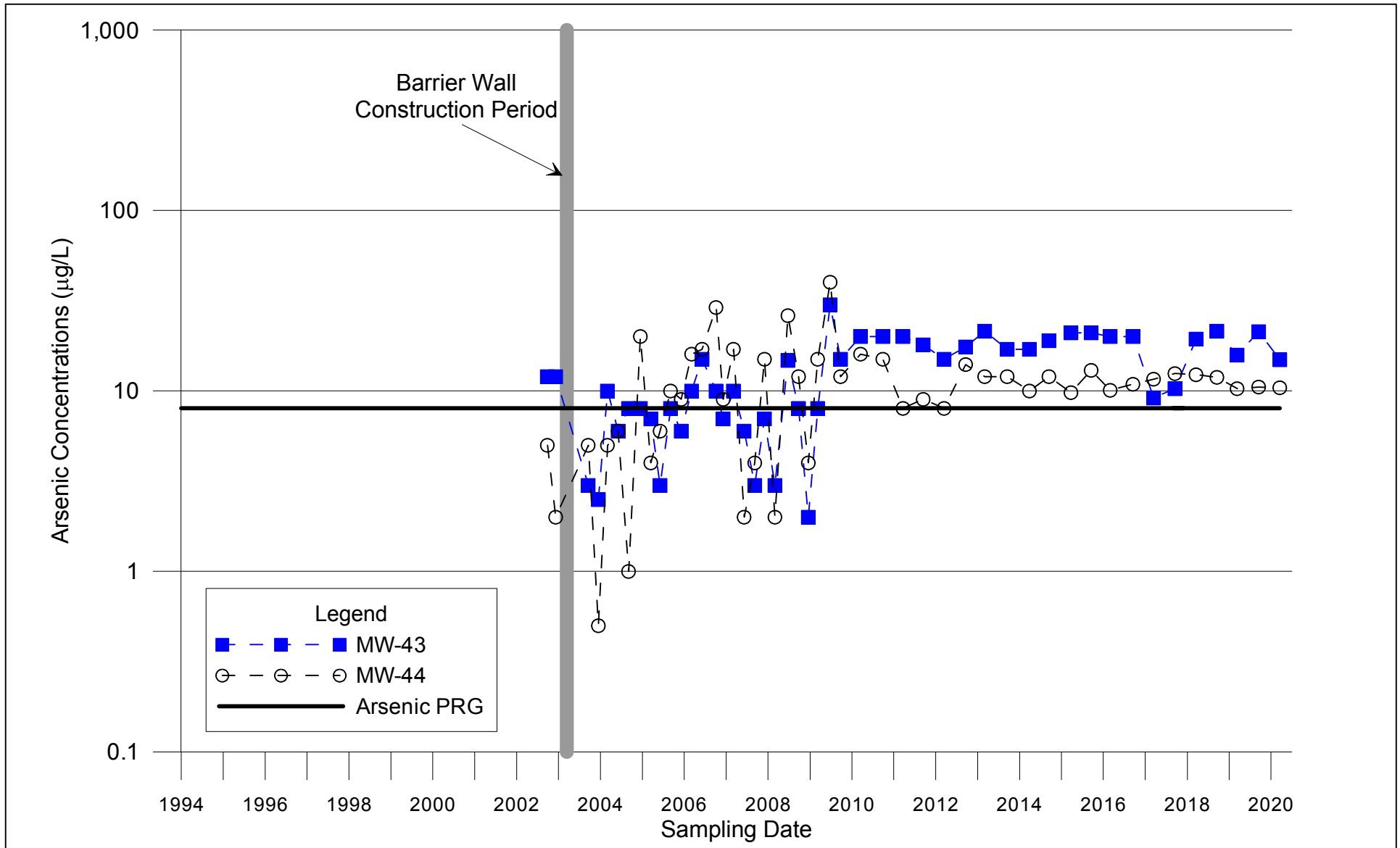
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME: MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 23

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 24 O&M D-12.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

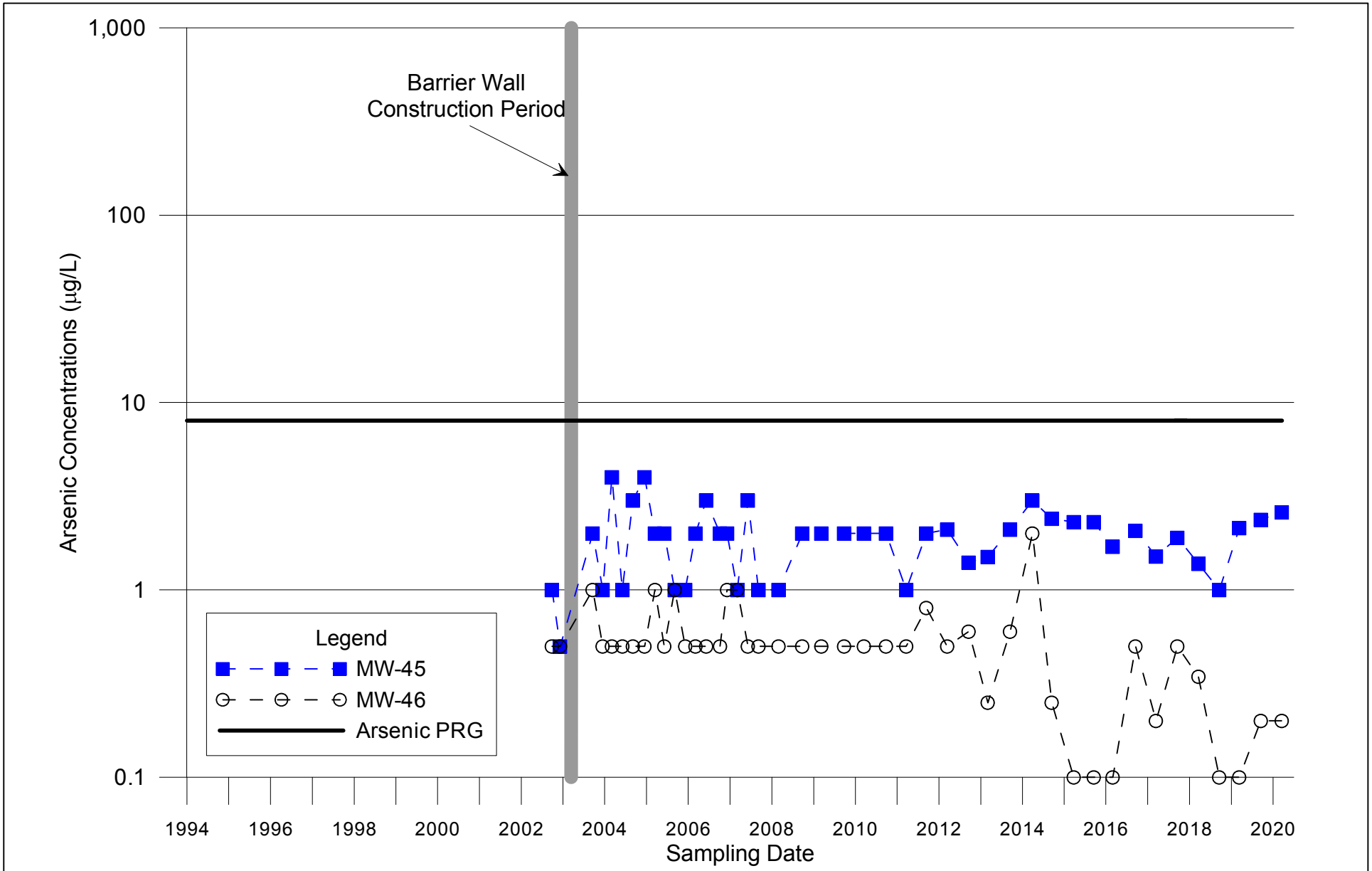
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME: MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 24

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 25 O&M D-13.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

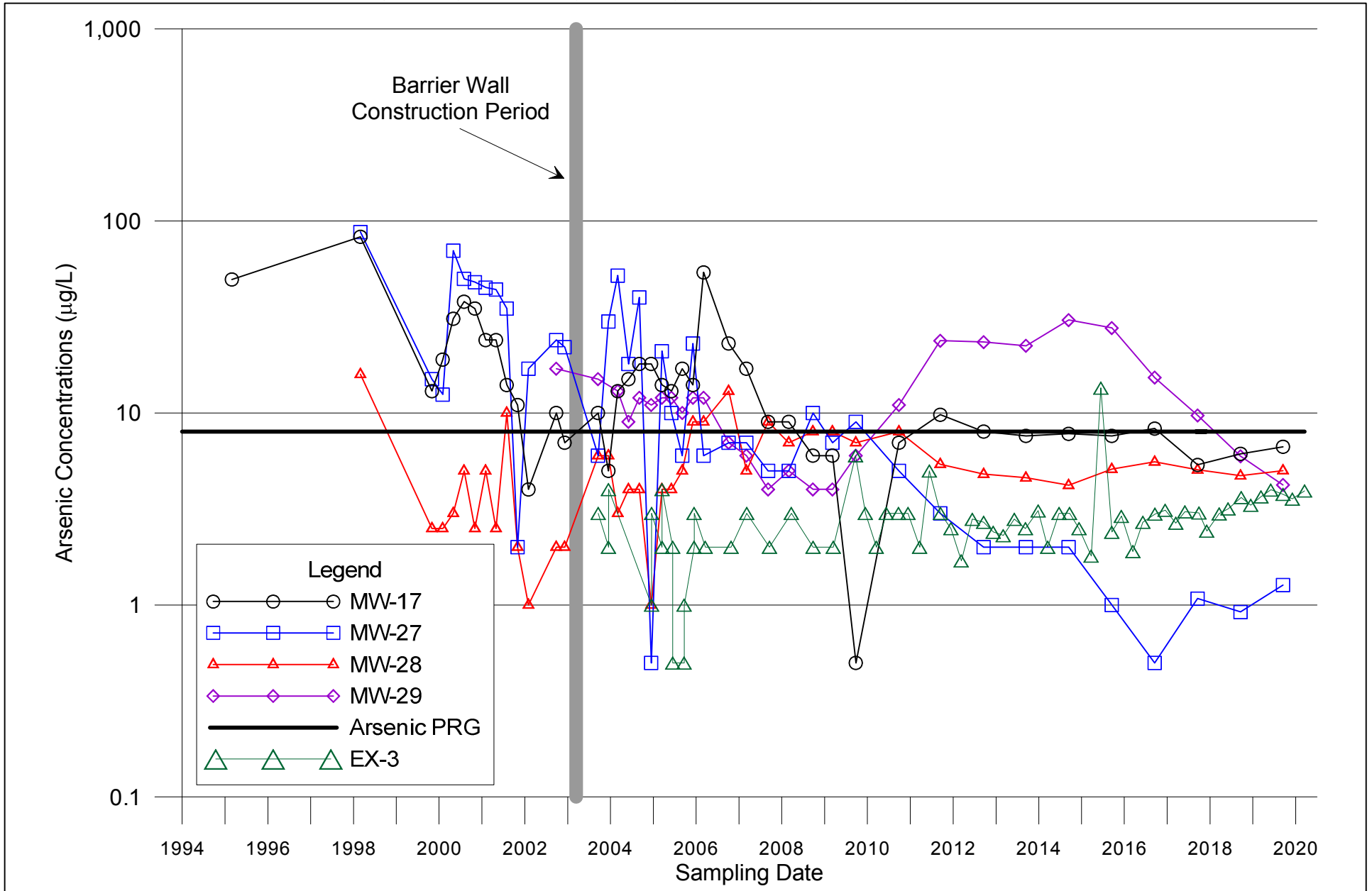
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME: MW-45 AND MW-46
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 25

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 26 O&M D-14.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Arsenic PRG for groundwater is 8.0 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

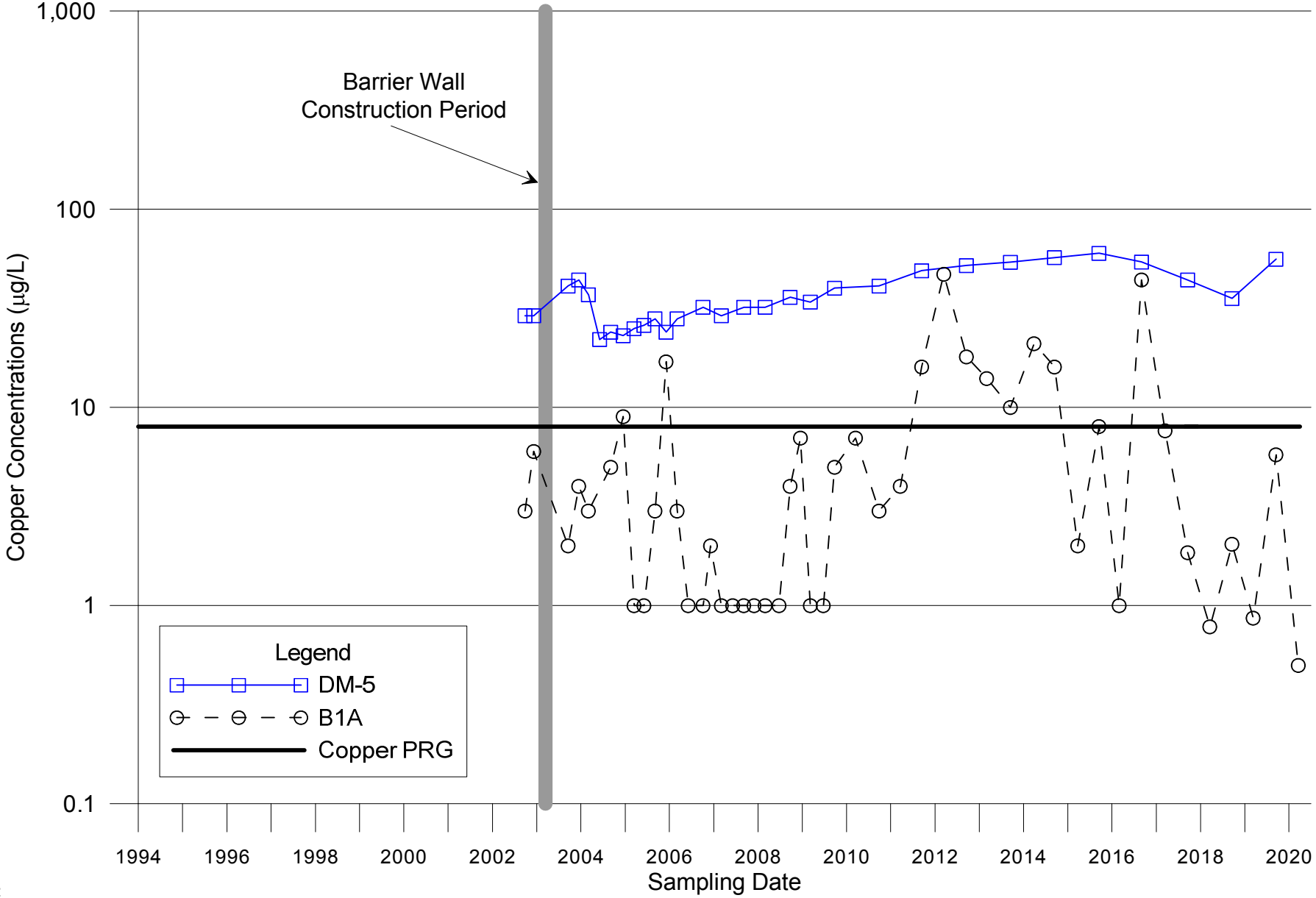
wood.

TOTAL ARSENIC CONCENTRATIONS VS. TIME:
MW-17, MW-27, MW-28, AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 26

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 27 O&M D-1.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

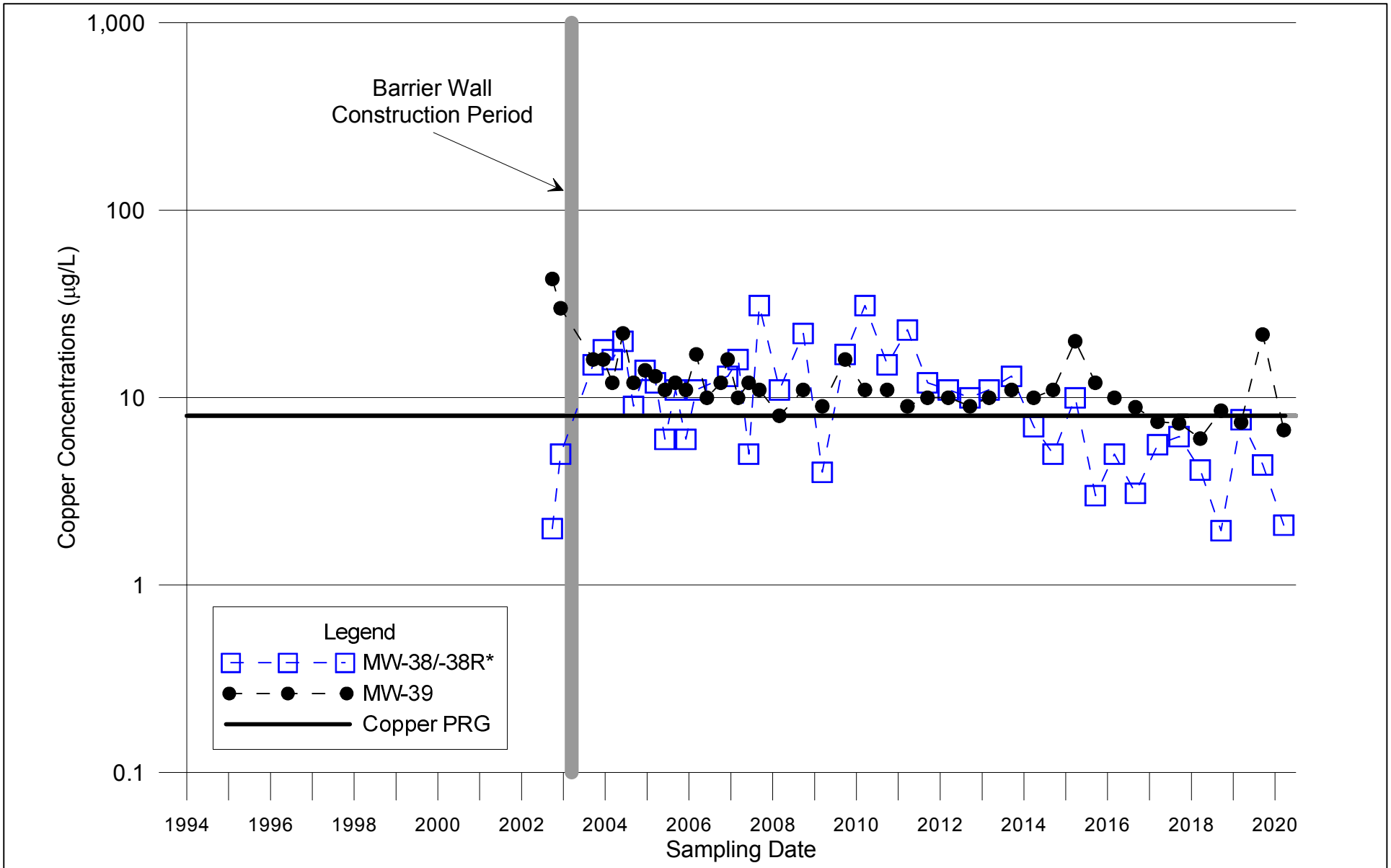
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 27

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 28 O&M D-2.grf



NOTE:
1. MW-38 was replaced by MW-38R in October 2006.
2. One-half the reporting limit was used for nondetect values.
3. The Copper PRG for groundwater is 8.0 µg/L.
4. Dashed line indicates well located outside of barrier wall.
5. Hollow Points = Upper Aquifer Zone Well
6. Solid Points = Lower Aquifer Zone Well
7. PRG= Preliminary Remediation Goals

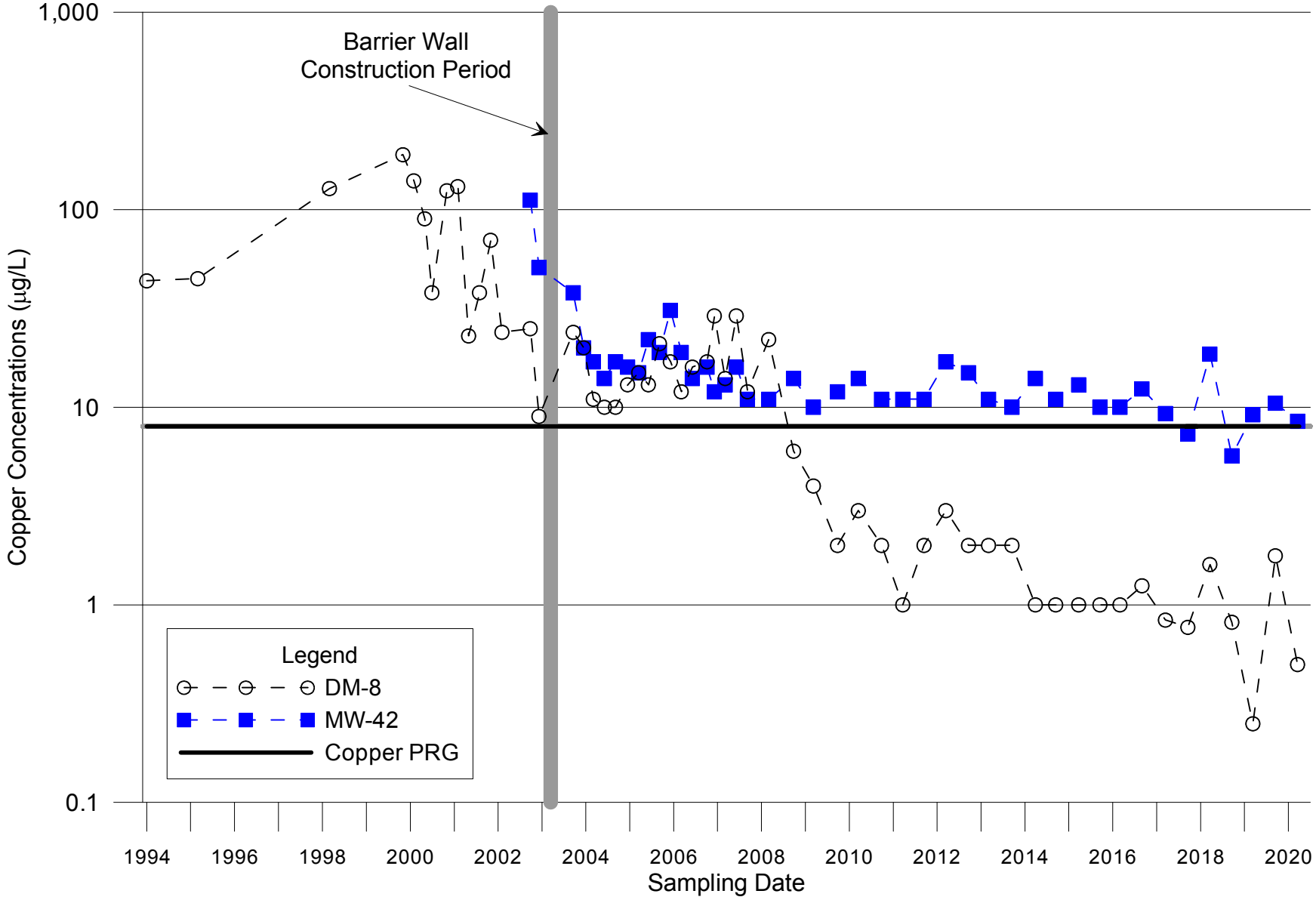
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME:
MW-38/-38R AND MW-39
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 28

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 29 O&M D-3.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

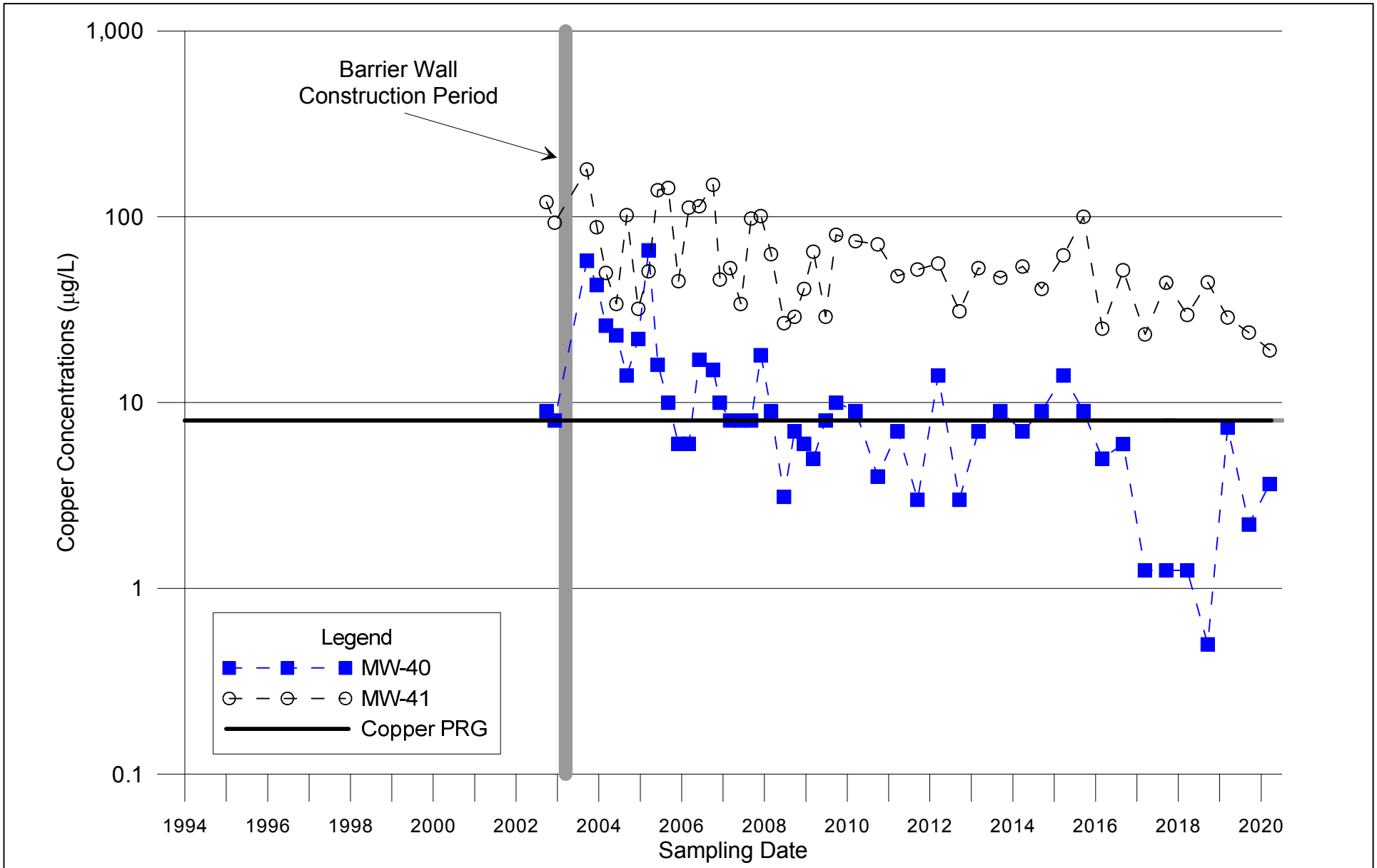
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME: DM-8 AND MW-42
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 29

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 30 O&M D-4.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals.

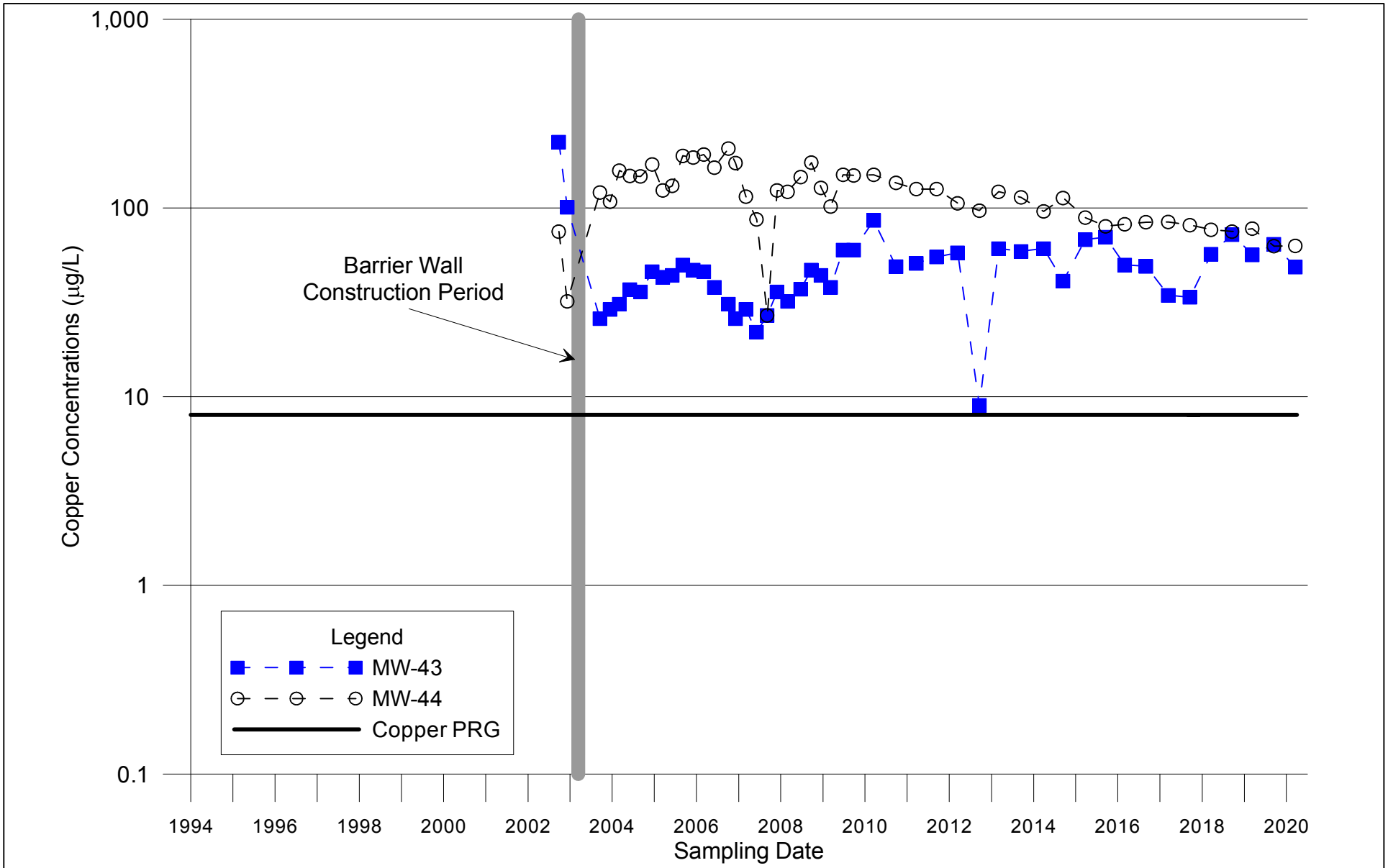
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME: MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 30

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 31 O&M D-5.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

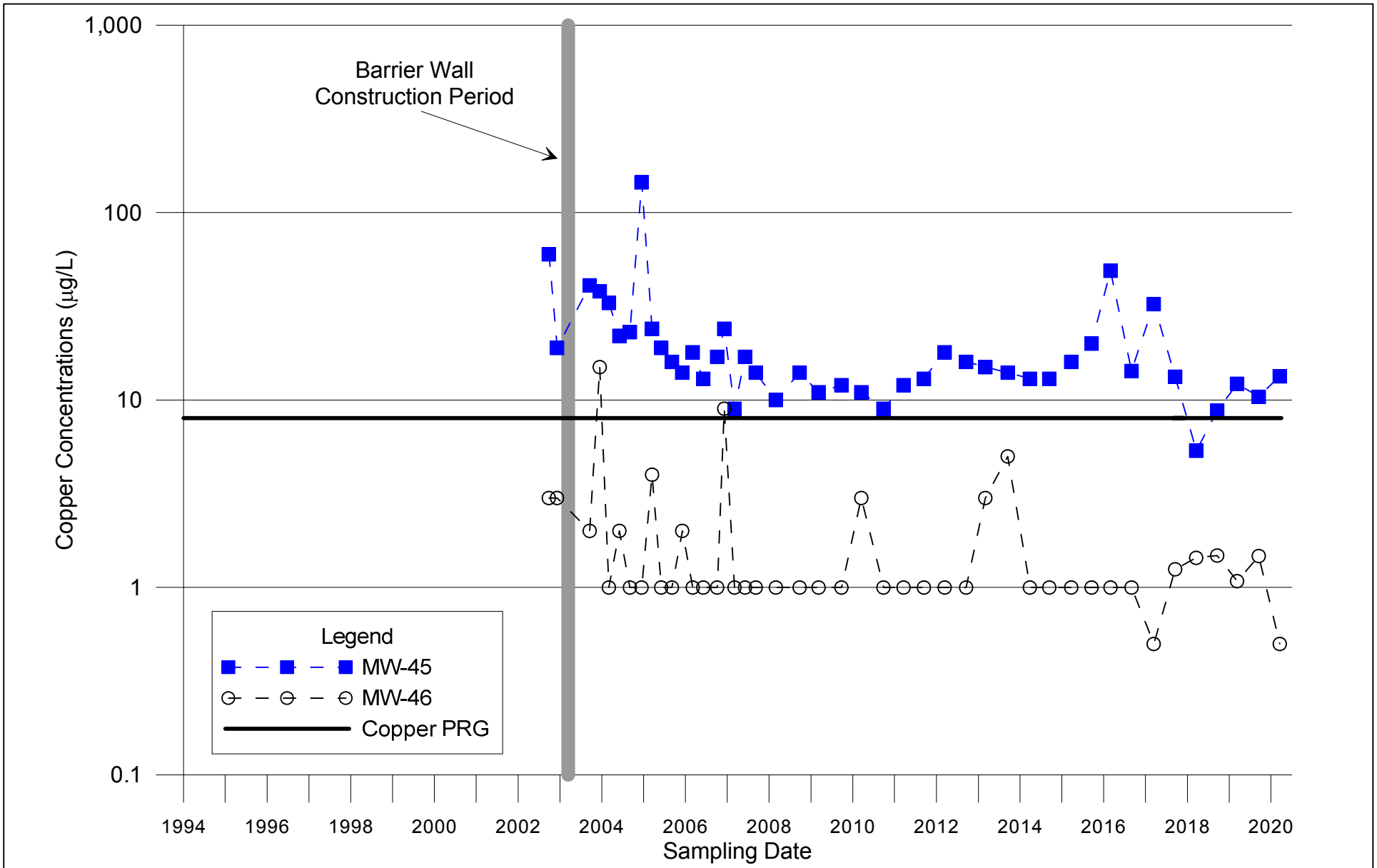
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME:
MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
31

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 32 O&M D-6.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

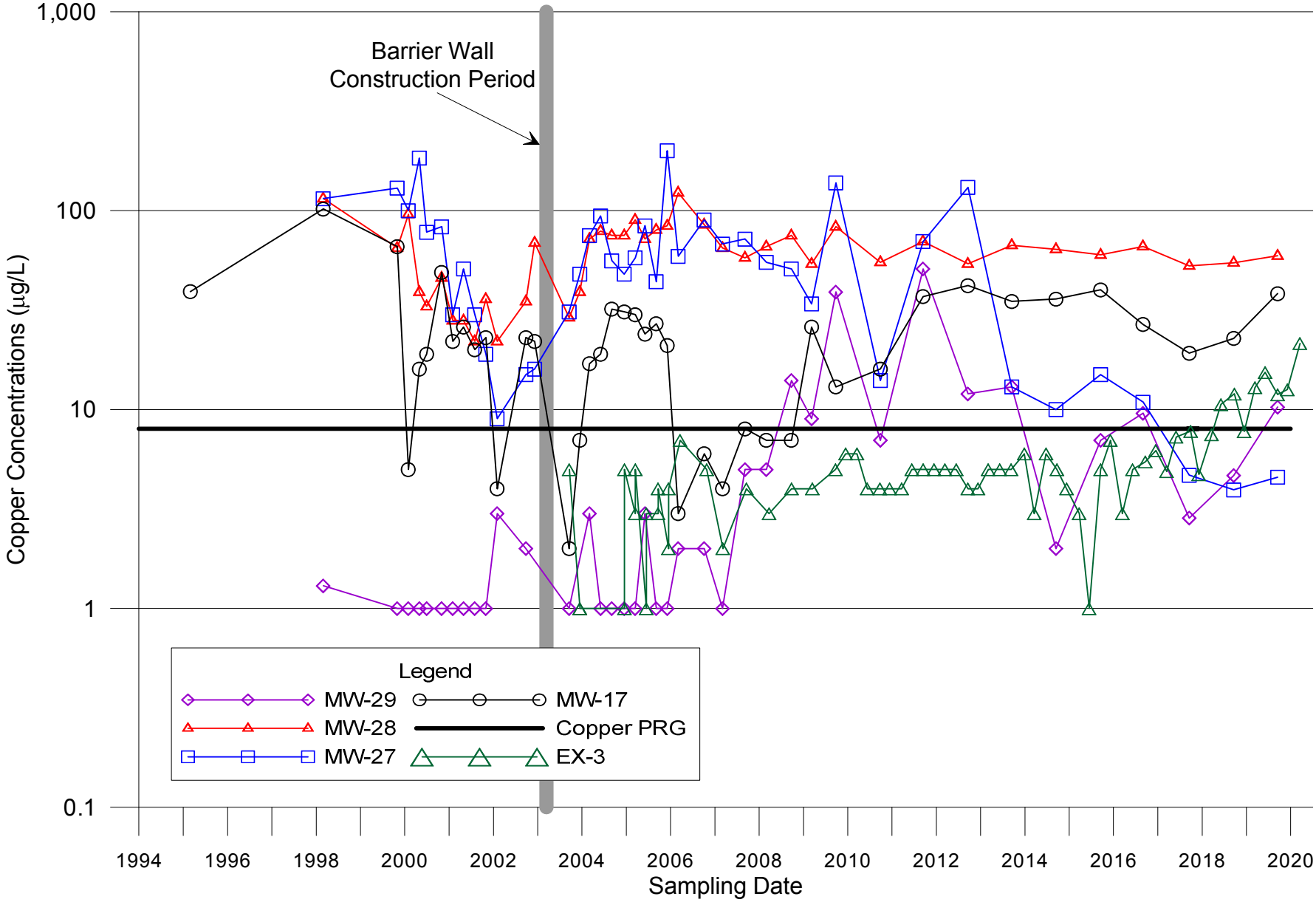
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME: MW-45 AND MW-46
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 32

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 33 O&M D-7.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Copper PRG for groundwater is 8.0 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

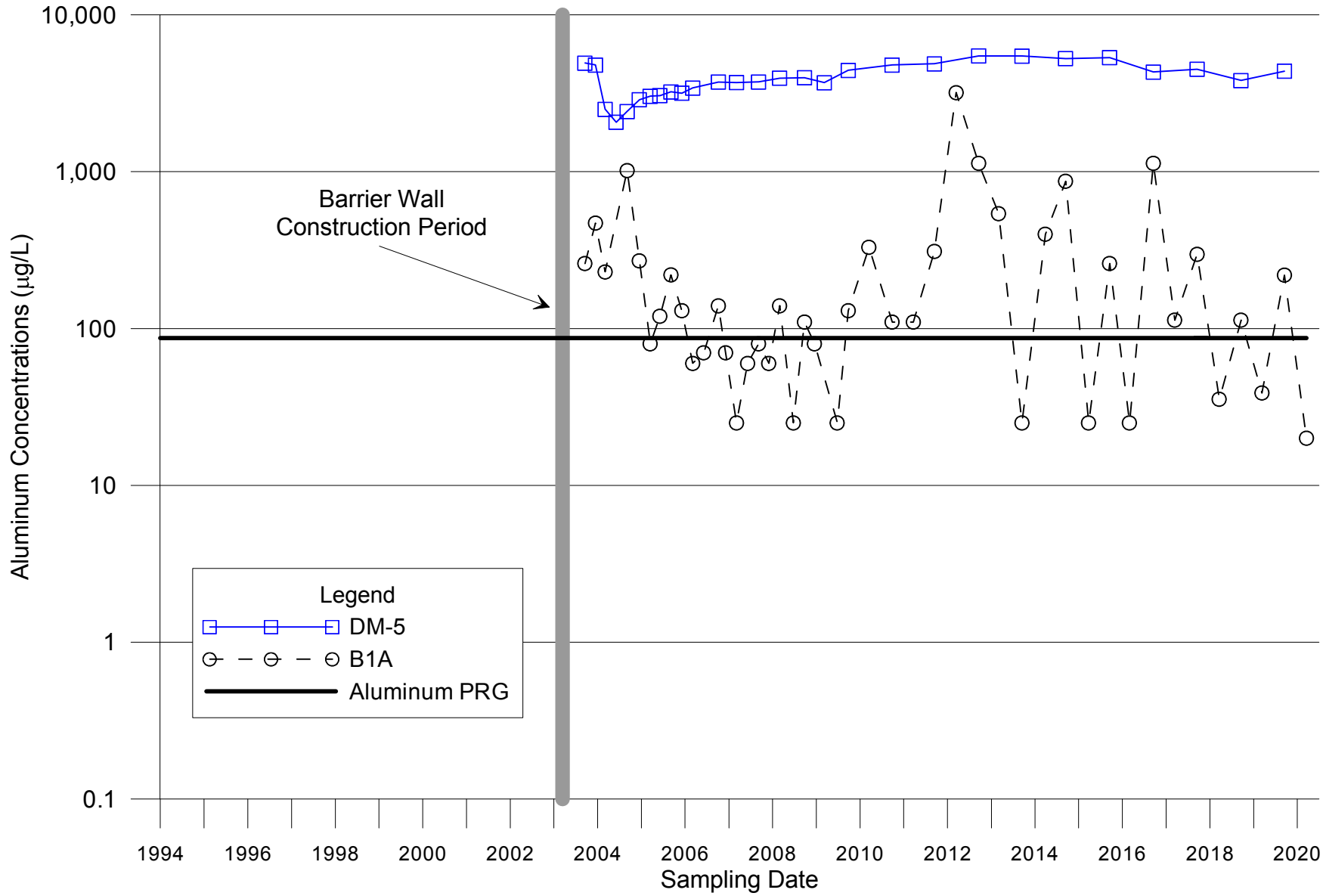
wood.

TOTAL COPPER CONCENTRATIONS VS. TIME:
MW-17, MW-27, MW-28 AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 33

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 34 O&M D-22.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The aluminum PRG for groundwater is 87.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

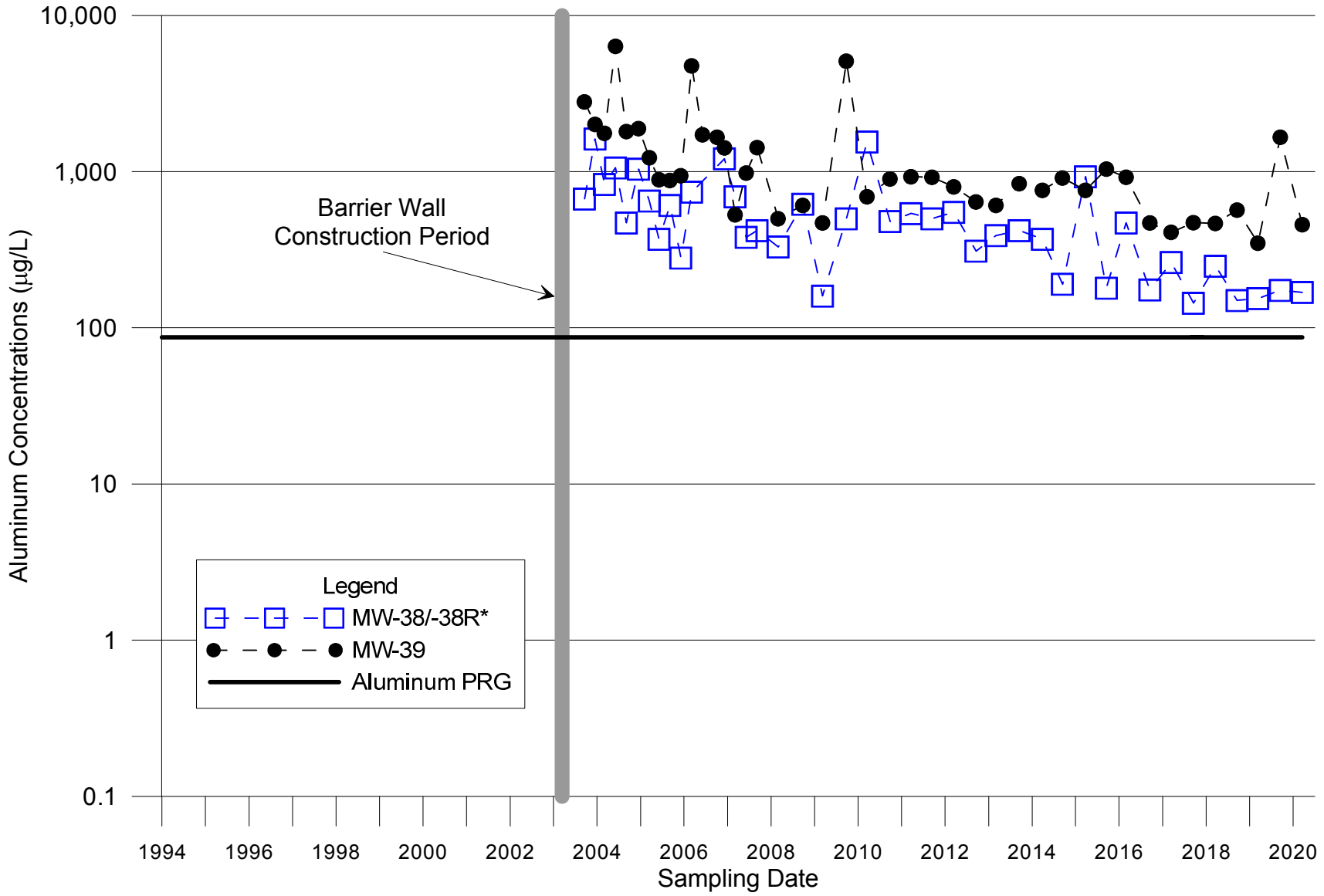
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 34

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 35 O&M D-23.grf



NOTE:
1. MW-38 was replaced by MW-38R in October 2006.
2. One-half the reporting limit was used for nondetect values.
3. The aluminum PRG for groundwater is 87.0 µg/L.
4. Dashed line indicates well located outside of barrier wall.
5. Hollow Points = Upper Aquifer Zone Well
6. Solid Points = Lower Aquifer Zone Well
7. PRG= Preliminary Remediation Goals

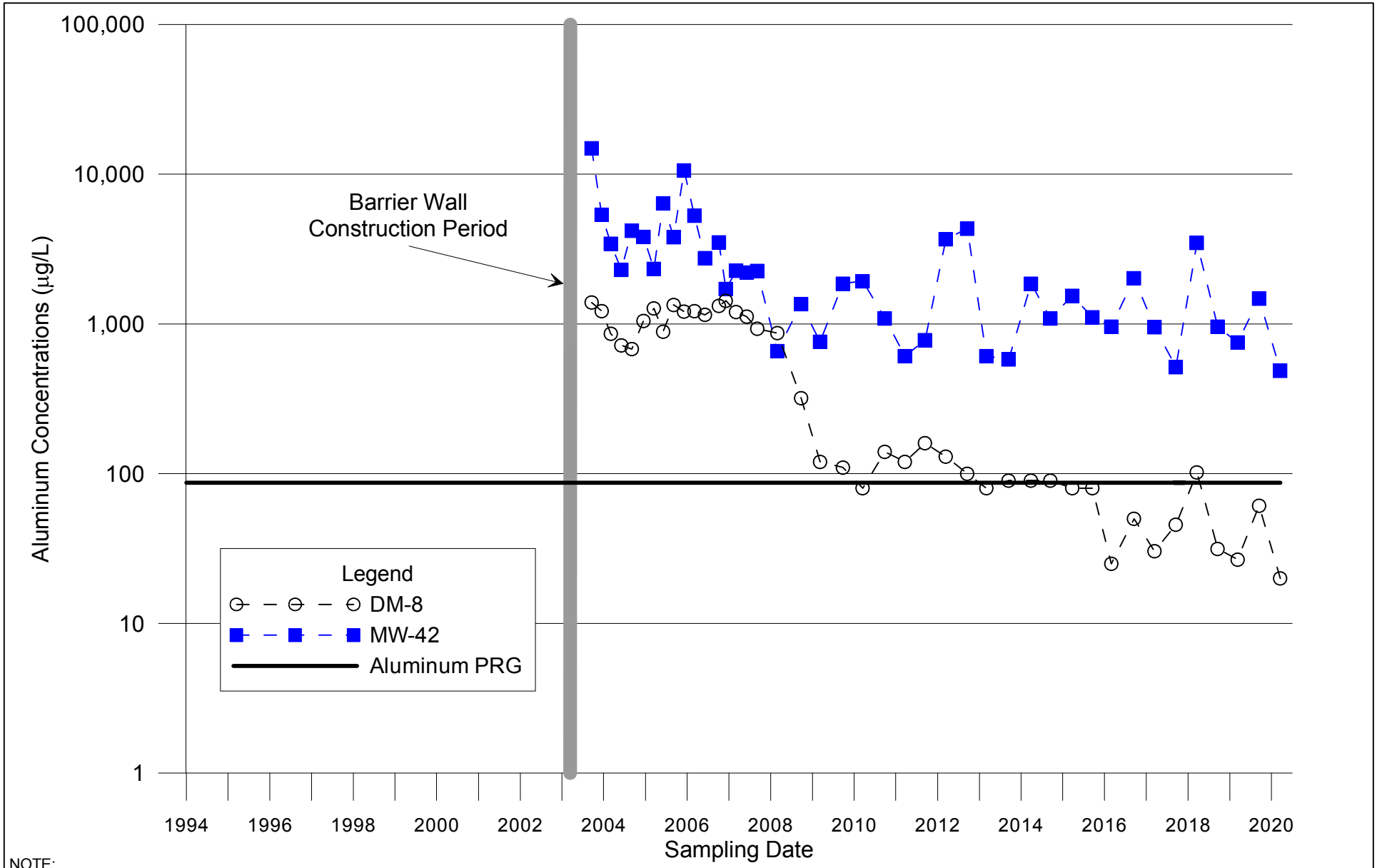
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME:
MW-38/-38R AND MW-39
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
35

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 36 O&M D-24.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The aluminum PRG for groundwater is 87.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

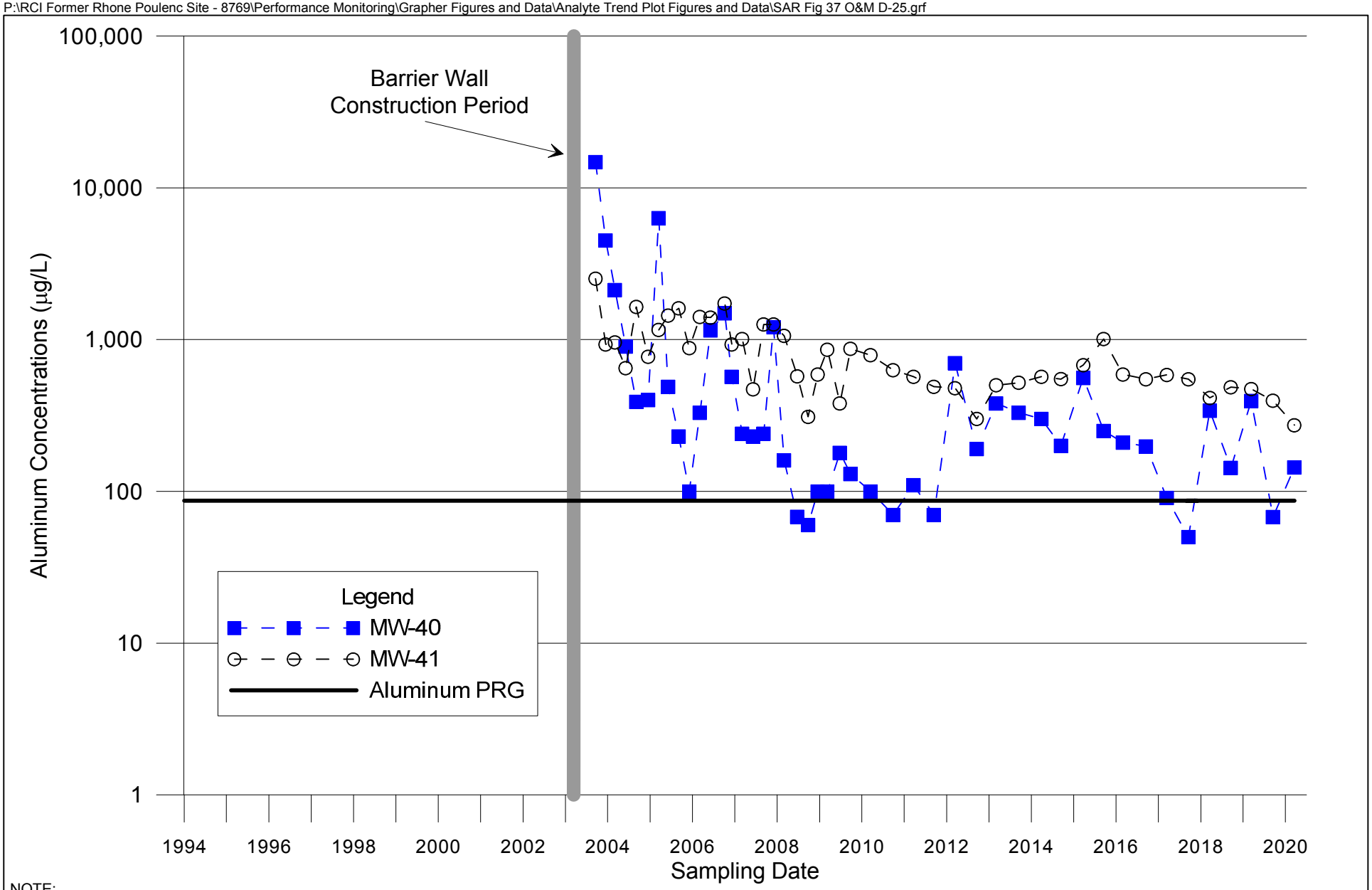
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME: DM-8 AND MW-42
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 36

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 37 O&M D-25.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Aluminum PRG for groundwater is 87.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

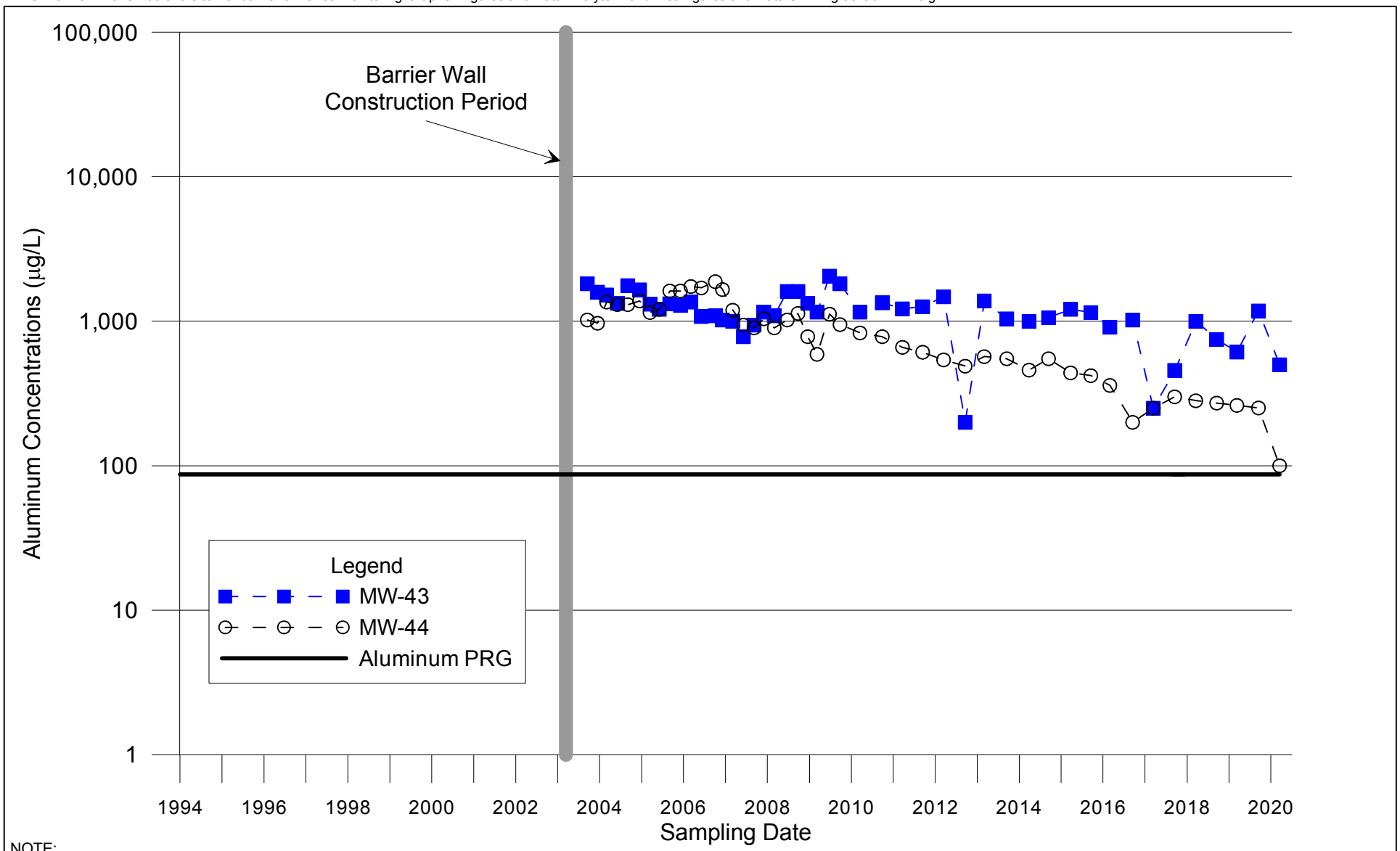
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME:
MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
37

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 38 O&M D-26.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Aluminum PRG for groundwater is 87.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

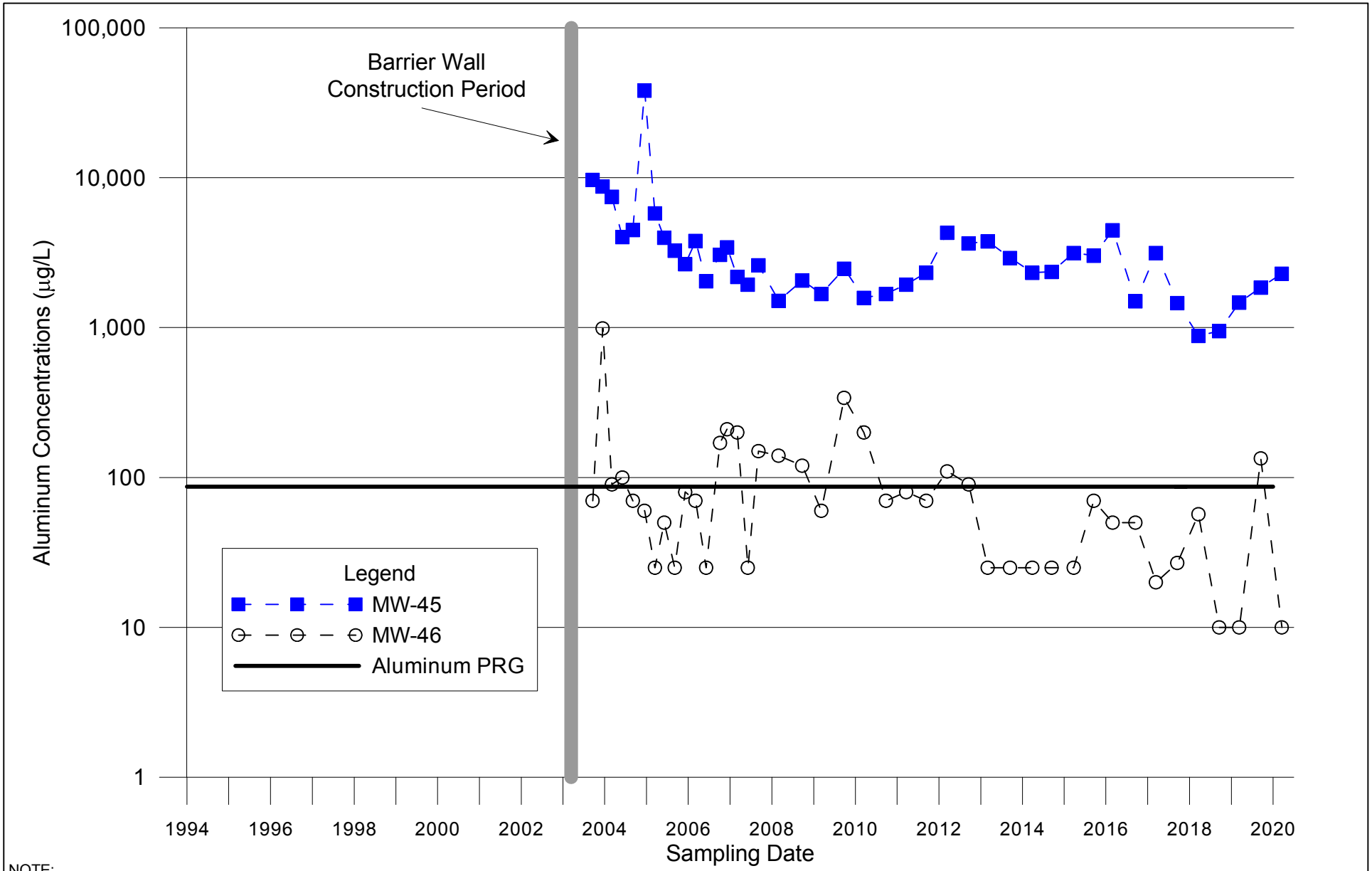
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME: MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 38

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 25 O&M D-13.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Aluminum PRG for groundwater is 87.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

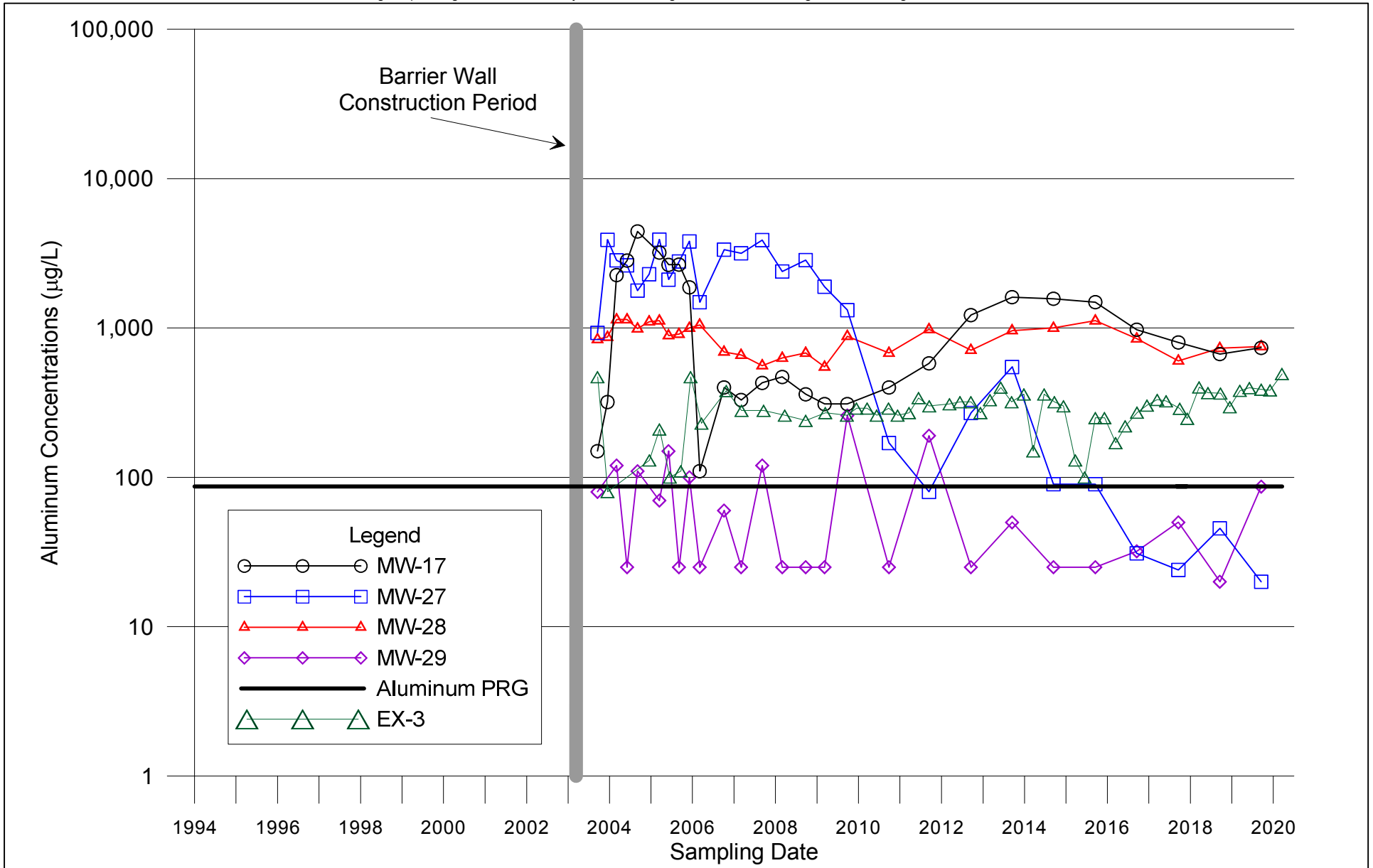
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME:
MW-45 AND MW-46
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
39

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 40 O&M D-28.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The aluminum PRG for groundwater is 87.0 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

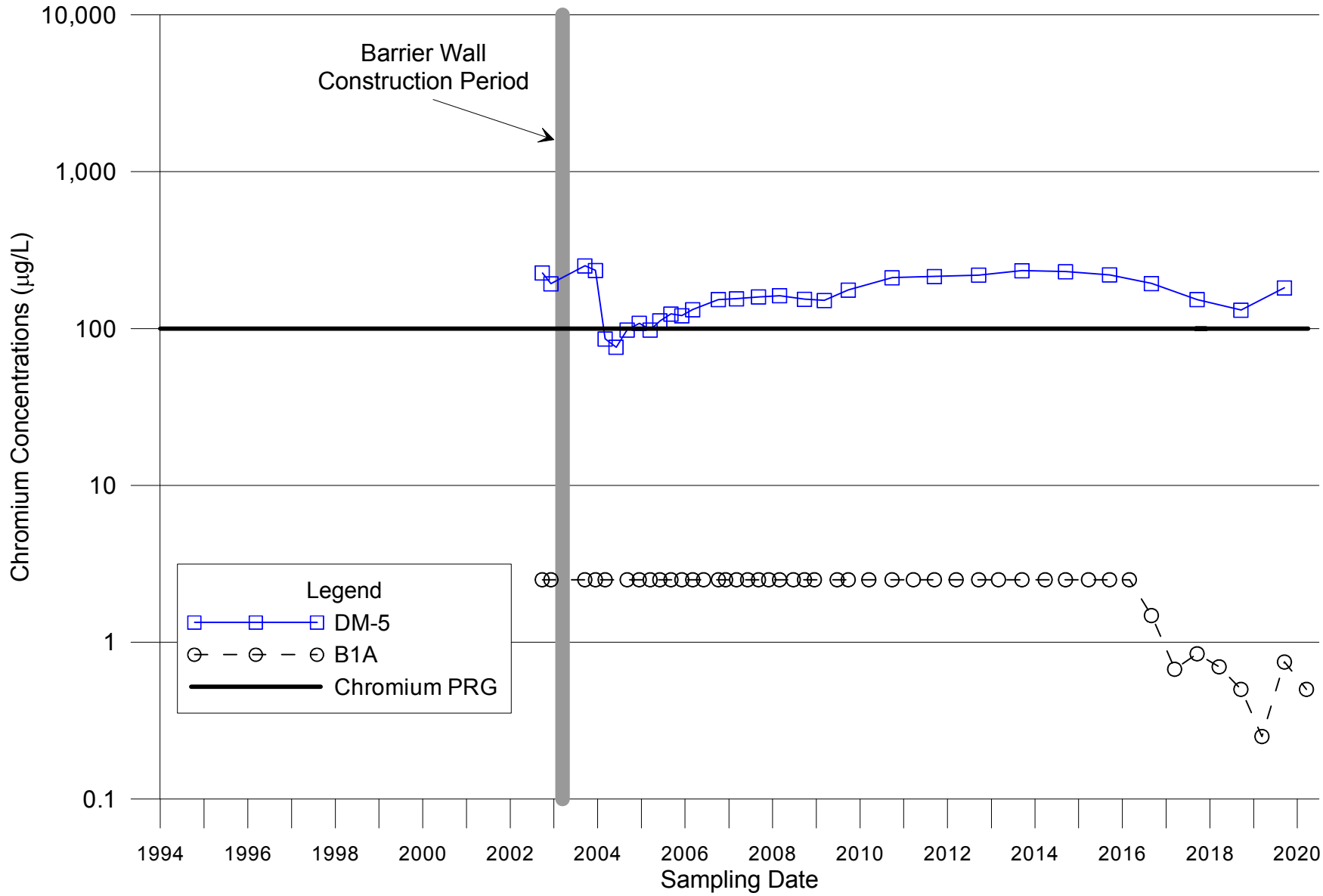
wood.

TOTAL ALUMINUM CONCENTRATIONS VS. TIME:
MW-17, MW-27, MW-28, AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 40

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 41 O&M D-29.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The chromium PRG for groundwater is 100 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

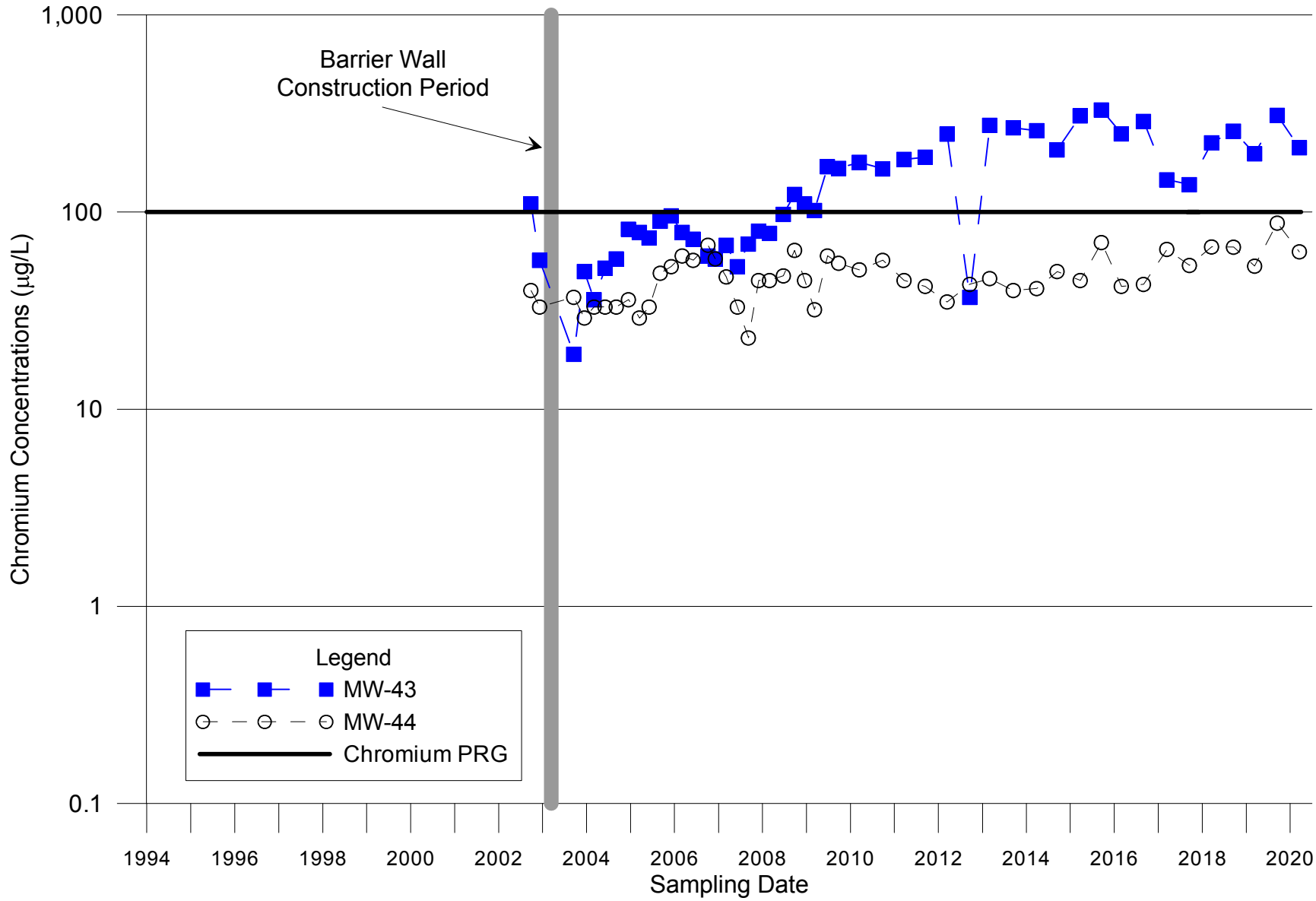
wood.

TOTAL CHROMIUM CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 41

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 42 O&M D-30.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Chromium PRG for groundwater is 100 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Solid Points = Lower Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

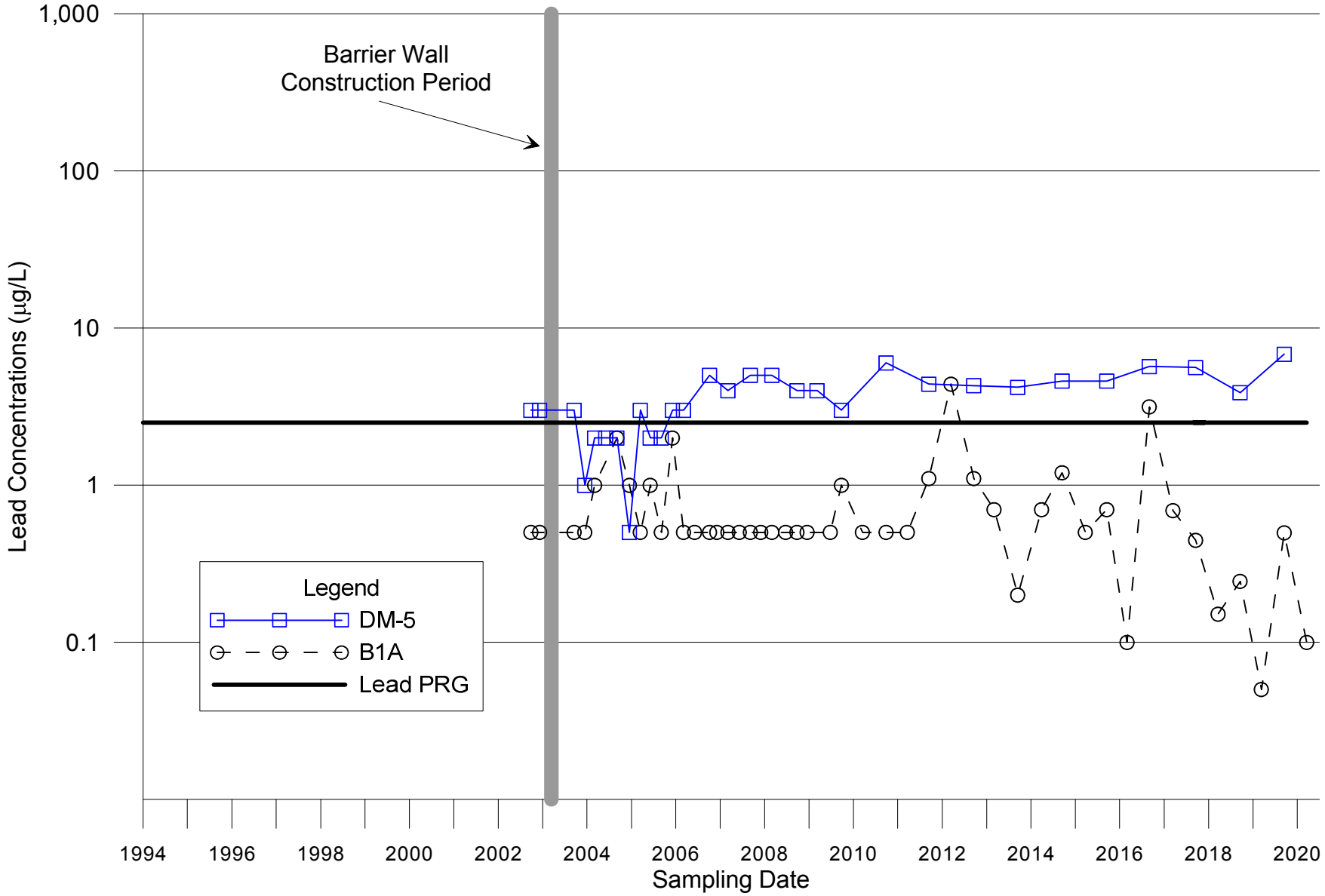
wood.

TOTAL CHROMIUM CONCENTRATIONS VS. TIME: MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 42

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 43 O&M D-31.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Lead PRG for groundwater is 2.5 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Solid Points = Lower Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

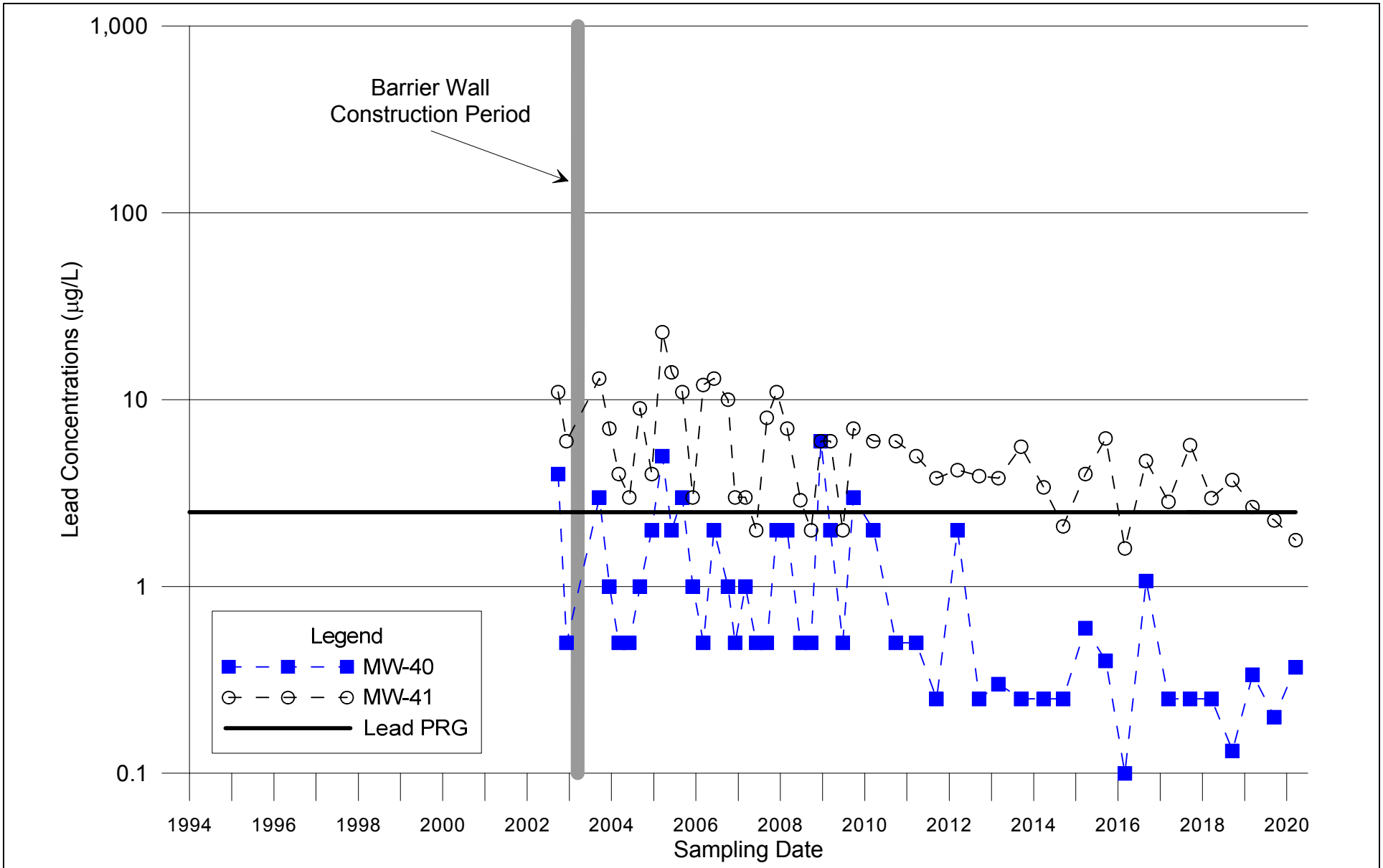
wood.

TOTAL LEAD CONCENTRATIONS VS. TIME:
DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 43

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 44 O&M D-32.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Lead PRG for groundwater is 2.5 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

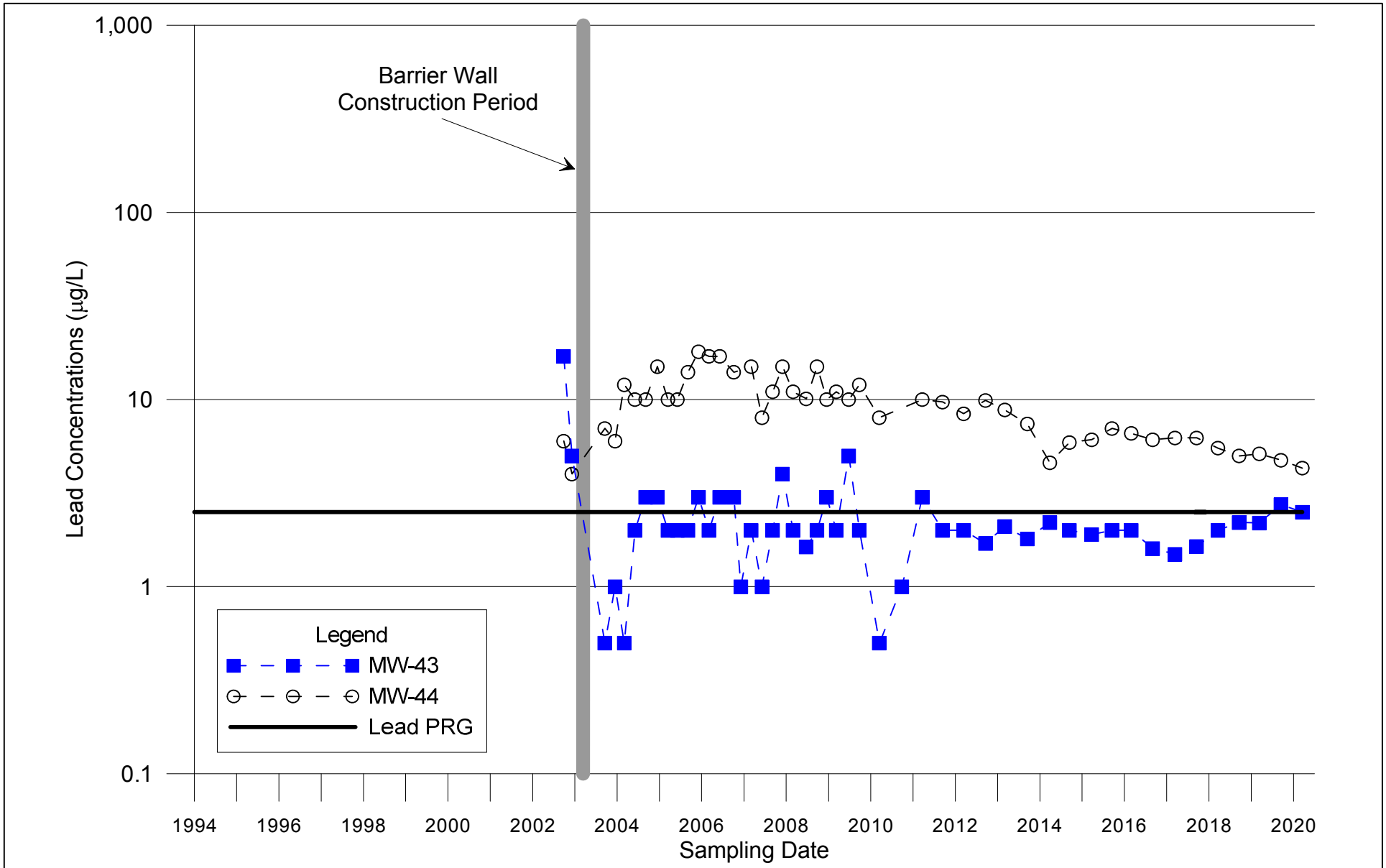
wood.

TOTAL LEAD CONCENTRATIONS VS. TIME:
MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 44

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 44 O&M D-32.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Lead PRG for groundwater is 2.5 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

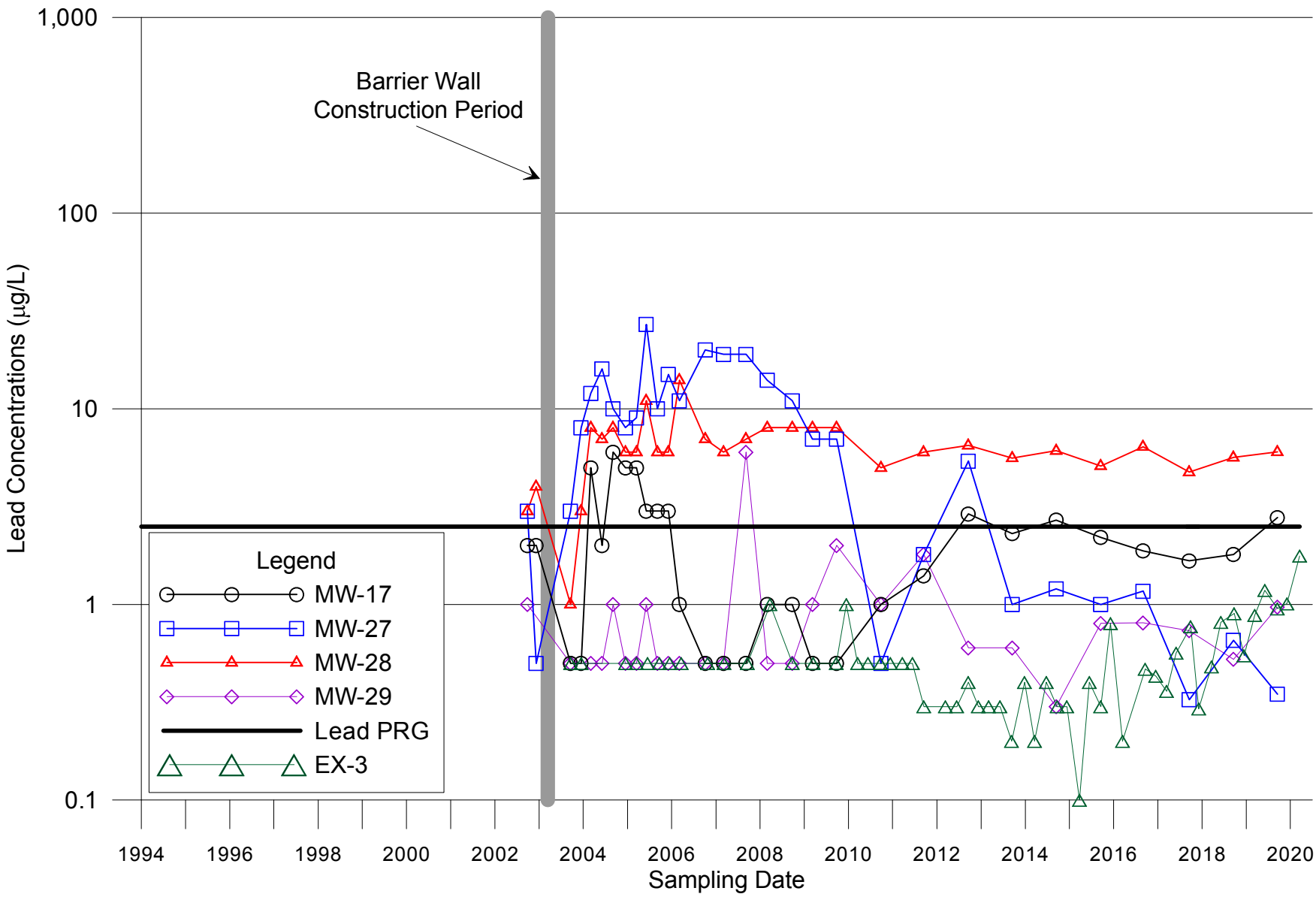
wood.

TOTAL LEAD CONCENTRATIONS VS. TIME:
MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 45

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 43 O&M D-31.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Lead PRG for groundwater is 2.5 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

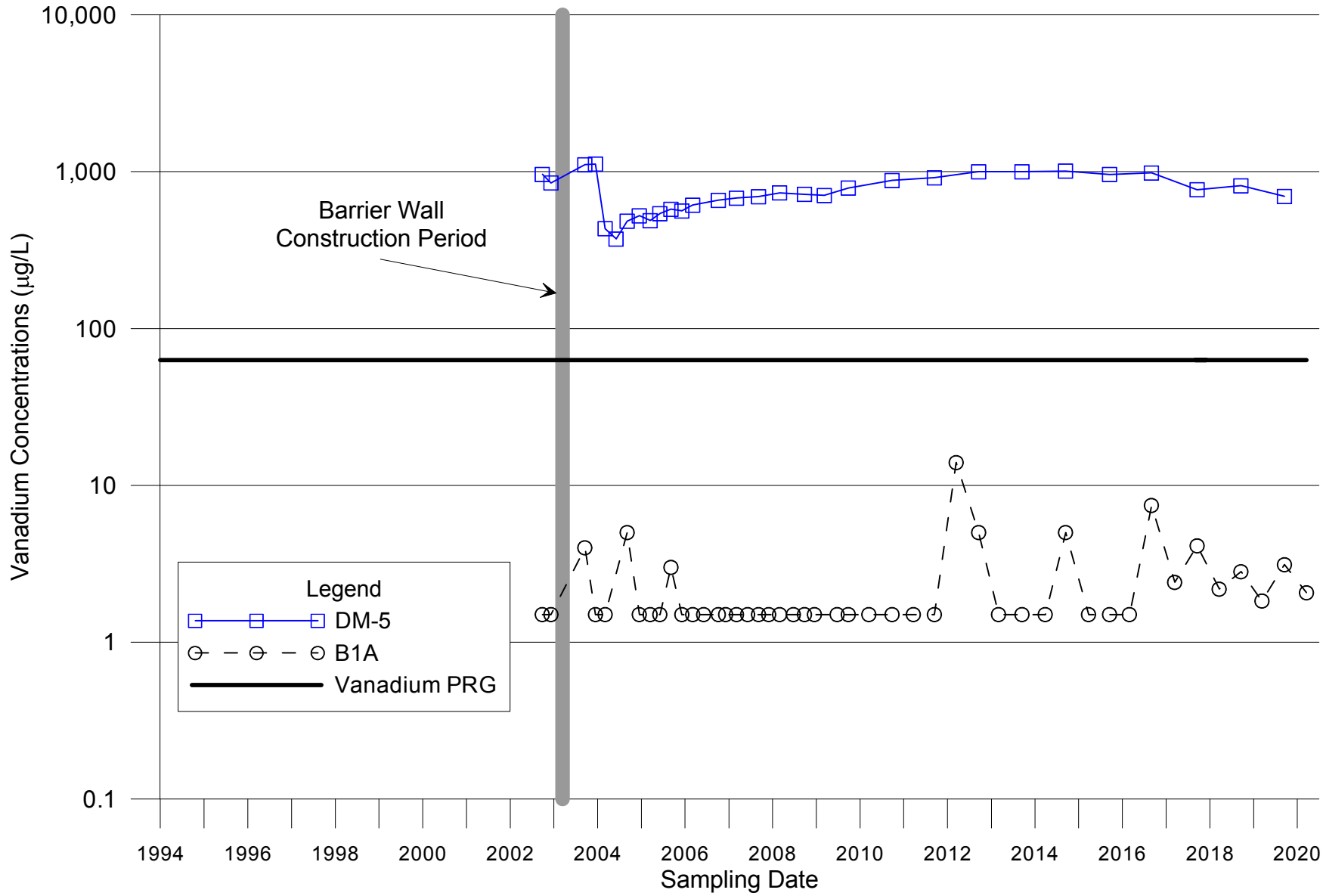
wood.

TOTAL LEAD CONCENTRATIONS VS. TIME:
MW-17, MW-27, MW-28, AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
46

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 45 O&M D-33.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The vanadium PRG for groundwater is 63.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminiary Remediation Goals

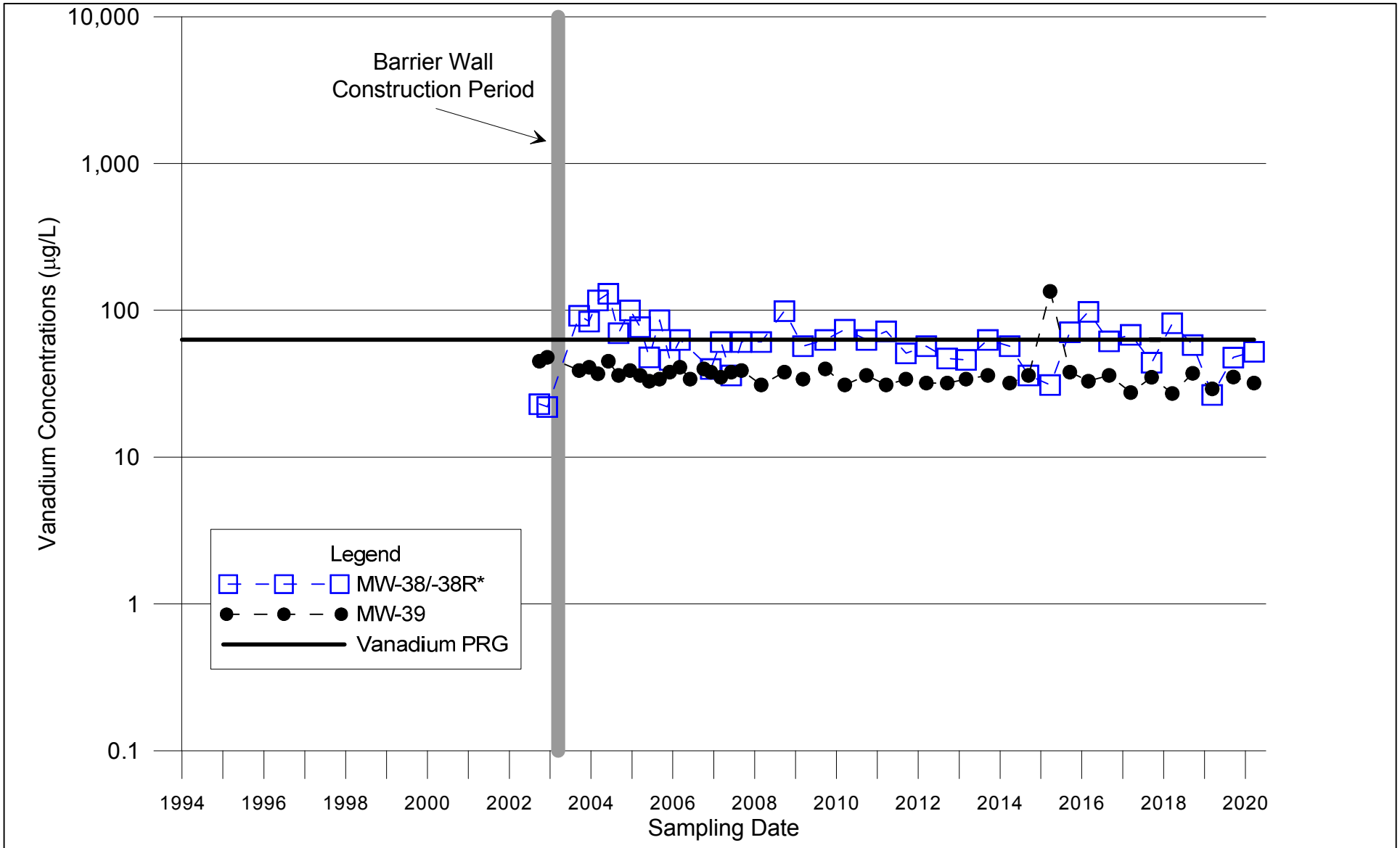
wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME: DM-5 AND B1A
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 47

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 35 O&M D-23.grf



NOTE:
1. MW-38 was replaced by MW-38R in October 2006.
2. One-half the reporting limit was used for nondetect values.
3. The Vanadium PRG for groundwater is 63.0 µg/L.
4. Dashed line indicates well located outside of barrier wall.
5. Hollow Points = Upper Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

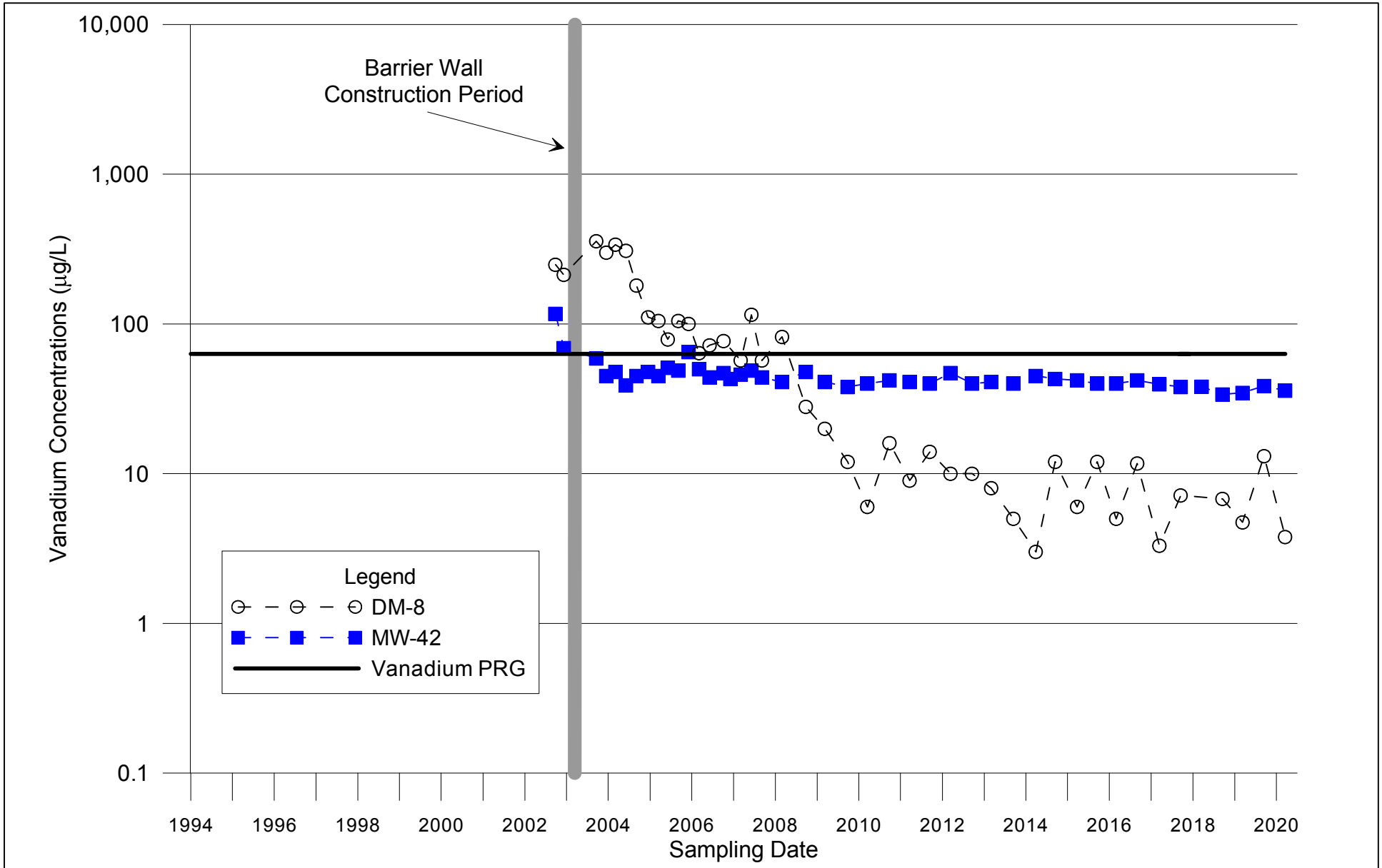
wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME:
MW-38/-38R AND MW-39
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
48

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 47 O&M D-35.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Vanadium PRG for groundwater is 63.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

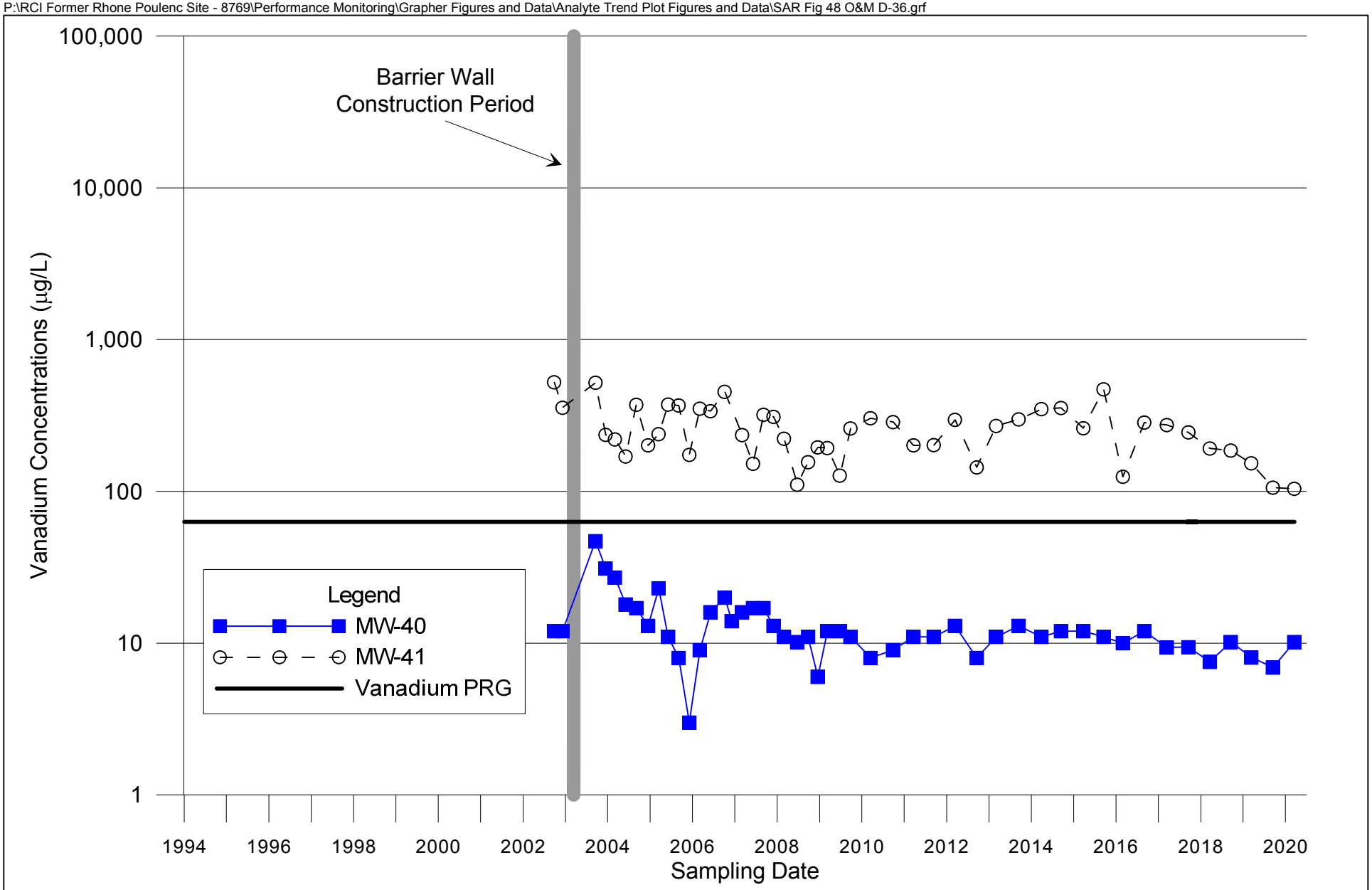
wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME: DM-8 AND MW-42
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 49

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 48 O&M D-36.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Vanadium PRG for groundwater is 63.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. PRG= Preliminary Remediation Goals

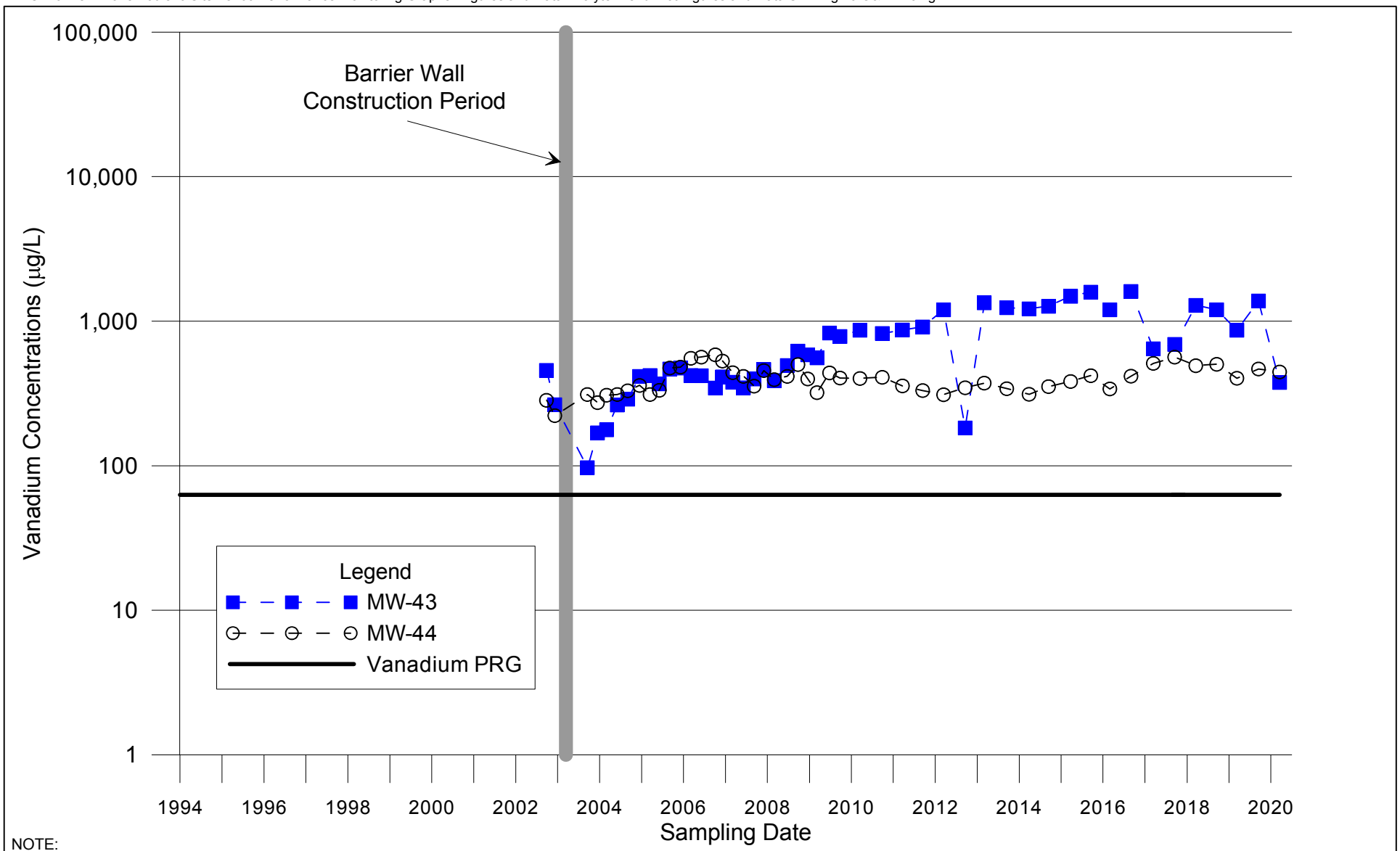
wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME: MW-40 AND MW-41
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 50

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 49 O&M D-37.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Vanadium PRG for groundwater is 63.0 µg/L.
3. Dashed line indicates well located outside of barrier wall.
4. Hollow Points = Upper Aquifer Zone Well
5. Solid Points = Lower Aquifer Zone Well
6. PRG= Preliminary Remediation Goals

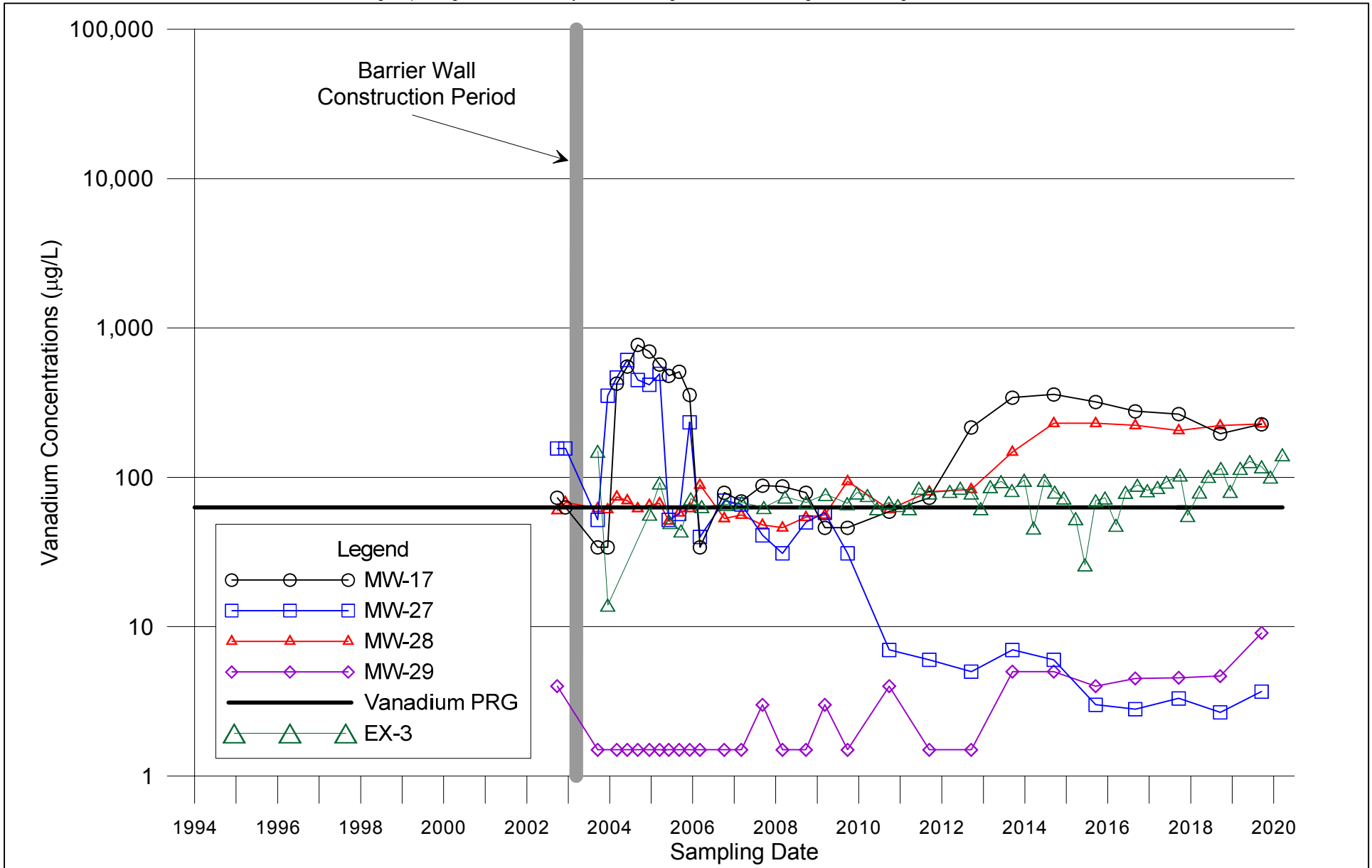
wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME: MW-43 AND MW-44
Former Rhone-Poulenc Site
Tukwila, Washington

Project No. 8769

Figure No. 51

P:\RCI Former Rhone Poulenc Site - 8769\Performance Monitoring\Grapher Figures and Data\Analyte Trend Plot Figures and Data\SAR Fig 50 O&M D-38.grf



NOTE:
1. One-half the reporting limit was used for nondetect values.
2. The Vanadium PRG for groundwater is 63.0 µg/L.
3. Hollow Points = Upper Aquifer Zone Well
4. PRG= Preliminary Remediation Goals

wood.

TOTAL VANADIUM CONCENTRATIONS VS. TIME:
MW-17, MW-27, MW-28, AND MW-29
Former Rhone-Poulenc Site
Tukwila, Washington

Project No.
8769

Figure No.
52

Tables

TABLE 1: PERFORMANCE MONITORING WELL SCREEN INTERVALS

Former Rhone-Poulenc Site, Tukwila, Washington

Well ID	Total Depth (feet bgs)	Screen Interval (feet bgs)
B1A	16.7	6.7–16.7
DM-5	37.0	16–36
DM-8	36.0	16–36
MW-17	22.3	7.3–22.3
MW-27	21.1	6.1–21.1
MW-28	36.8	26.8–36.8
MW-29	21.4	6.4–21.4
MW-38R	30.0	9.7–29.5
MW-39	50.0	40–50
MW-40	59.0	49–59
MW-41	35.0	14–34
MW-42	59.0	49–59
MW-43	61.3	51.3–61.3
MW-44	41.6	31.6–41.6
MW-45	61.4	51.4–61.4
MW-46	36.2	26.2–36.2
EX-3	41.4	16.4–36.4

Abbreviations

bgs = below ground surface

TABLE 2: GENERAL FIELD PARAMETER RESULTS, MARCH 2020

Former Rhone-Poulenc Site, Tukwila, Washington

Parameter	Well ID					
	B1A	DM-8	MW-38R	MW-39	MW-40	MW-41
	3/18/2020	3/18/2020	3/19/2020	3/19/2020	3/18/2020	3/18/2020
Temperature (degrees C)	14.3	13.0	14.9	14.3	12.5	12.9
Field pH (standard units)	6.74	6.71	6.70	7.46	7.96	10.02
Specific Conductivity (µS/cm)	1,164	3,009	799	2,689	12,333	6,968
Dissolved Oxygen (mg/L)	-0.50	0.04	0.58	0.05	0.00	-0.06
Oxidation-Reduction Potential (mV)	-188.1	-111.2	-135.8	-174.3	-333.7	-394.4
Turbidity (NTUs)	3.2	5.1	4.2	120.5	10.3	10.9

Parameter	Well ID					
	MW-42	MW-43	MW-44	MW-45	MW-46	EX-3
	3/18/2020	3/19/2020	3/19/2020	3/19/2020	3/20/2020	3/18/2020
Temperature (degrees C)	13.0	12.3	13.4	12.7	13.3	15.0
Field pH (standard units)	7.70	11.14	11.17	7.46	6.44	6.71
Specific Conductivity (µS/cm)	2,926	6,535	7,752	2,104	6,112	1,392
Dissolved Oxygen (mg/L)	-0.05	-0.07	-0.05	-0.03	0.15	-0.07
Oxidation-Reduction Potential (mV)	-225.9	-482.0	-469.0	-234.5	-66.4	-178.4
Turbidity (NTUs)	615	13.5	4.8	172.0	2.8	4.7

Abbreviations:

µS/cm = microsiemens per centimeter

C = Celsius

mg/L = milligrams per liter

mV = millivolts

NTUs = nephelometric turbidity units

TABLE 3: GROUNDWATER ELEVATIONS

Former Rhone-Poulenc Site, Tukwila, Washington

Well ID	Inside/Outside Barrier Wall	TOC Elevation[1] (feet)	Depth to Water (feet) [1]																												
			3/7/13	6/6/13	9/12/13	12/27/13	3/17/14	6/24/14	9/23/14	12/12/14	3/23/15	6/11/15	9/14/15	12/8/15	3/17/16	6/8/16	9/22/16	12/15/16	3/16/17	6/2/17	9/28/17	12/7/17	3/22/18	6/6/18	9/27/18	12/12/18	3/14/19	6/4/19	9/18/19	12/4/19	3/19/20
B1A	Outside	18.71	7.83	9.21	9.71	9.91	9.38	9.29	7.74	9.39	9.29	9.35	9.90	9.65	8.90	9.30	9.89	9.31	8.84	8.03	9.63	8.91	9.19	9.21	9.88	9.91	9.32	9.32	9.69	9.88	9.18
B1B	Outside	18.47	9.27	9.96	8.60	8.02	8.41	9.95	9.31	6.91	8.80	8.32	9.43	7.01	7.10	9.57	8.78	7.71	8.13	8.90	8.54	8.30	8.59	8.38	9.55	7.47	7.70	9.93	9.05	7.95	7.74
A2	Inside	18.59	16.08	16.15	16.12	16.35	16.07	16.25	15.92	15.62	15.87	16.26	16.07	15.72	15.35	16.10	16.59	15.86	15.48	16.00	16.08	16.85	15.92	15.98	16.28	15.85	16.06	16.30	16.05	16.08	16.92
DM-3A	Inside	17.81	15.19	15.22	15.19	15.46	15.03	15.38	15.01	15.46	15.01	7.73	15.22	14.85	14.47	15.22	15.71	14.99	14.41	15.07	NM	14.98	15.06	15.08	15.41	14.96	14.75	11.65	15.14	15.19	15.79
DM-3B	Inside	17.81	7.26	11.25	7.52	7.03	9.61	13.09	10.76	14.74	10.38	15.40	10.42	6.09	6.77	11.17	7.51	8.10	9.37	7.65	NM	8.59	9.97	10.11	10.41	6.20	7.11	15.40	9.66	6.85	7.36
DM-4	Inside	19.40	16.86	16.92	16.90	17.16	16.86	17.00	16.72	16.47	16.66	17.01	16.92	16.51	16.11	16.90	17.30	16.63	16.28	16.90	16.66	16.69	16.72	16.18	17.20	16.65	16.96	17.11	16.99	16.87	17.70
DM-5	Inside	18.80	16.15	16.15	16.14	16.45	16.17	16.36	16.02	15.82	15.96	16.24	16.12	15.81	15.36	16.20	16.54	15.95	15.60	16.03	16.10	15.93	16.03	16.07	16.31	16.00	16.12	16.35	16.12	16.16	16.87
DM-8	Outside	20.40	13.98	19.25	14.40	13.39	17.62	19.06	17.42	11.04	18.62	14.92	17.75	11.31	14.82	19.32	14.62	15.30	17.60	15.05	14.28	15.75	17.89	15.43	17.52	11.59	14.15	19.61	16.20	12.91	14.69
EX-1	Inside	19.16	16.59	17.70	17.78	16.86	16.60	16.74	17.19	16.16	16.38	16.77	16.60	16.26	15.85	16.59	17.09	16.37	16.00	16.52	16.62	16.38	16.42	16.52	16.79	16.36	16.59	16.81	16.57	16.59	17.43
EX-2	Inside	19.21	16.57	16.60	16.60	16.79	16.57	16.64	16.41	16.14	16.37	16.78	16.61	16.24	15.81	16.59	17.03	16.33	15.99	17.02	16.55	12.41	16.41	16.38	17.31	16.38	17.09	16.84	17.10	16.59	17.41
EX-3	Inside	18.92	16.30	16.37	16.28	16.59	16.30	16.47	16.13	15.90	16.10	16.42	17.25	15.94	15.55	16.32	16.70	16.06	15.74	16.21	16.05	17.26	16.14	16.22	16.49	16.01	16.26	17.95	16.31	16.31	17.10
MW-17	Inside	18.55	16.06	16.00	16.12	16.46	16.12	16.35	15.92	15.88	15.74	16.22	16.05	15.71	15.32	16.11	16.41	15.70	15.61	15.97	16.02	15.82	16.01	16.07	16.28	15.81	15.96	16.18	16.05	16.02	17.01
MW-20	Inside	18.96	16.46	16.50	16.42	16.76	16.44	16.62	16.31	16.02	16.25	16.58	18.48	16.11	15.66	16.46	16.84	16.22	15.88	16.34	16.37	16.35	16.33	16.39	16.70	16.20	16.42	16.74	16.44	16.48	17.26
MW-27	Inside	18.83	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-28	Inside	18.74	16.25	16.18	16.15	16.50	16.27	16.49	16.89	15.81	16.04	16.35	16.23	15.87	15.46	16.23	16.56	16.00	15.66	16.03	16.13	15.99	16.15	16.21	16.42	15.95	16.10	16.35	16.21	16.16	17.07
MW-29	Inside	18.37	15.91	15.88	15.88	16.20	15.91	16.02	15.77	15.52	15.70	16.03	15.88	15.51	15.12	15.91	16.24	15.66	15.34	15.75	15.79	15.65	15.84	16.00	16.23	15.63	15.91	16.01	16.00	15.84	16.85
MW-38R	Outside	16.83	10.50	14.95	10.92	10.29	13.13	14.77	13.76	8.38	13.61	11.30	13.41	8.31	10.12	14.93	11.28	11.31	13.05	11.25	10.88	11.73	13.44	11.61	13.42	8.70	10.46	15.02	12.20	9.65	10.77
MW-39	Outside	16.65	10.50	14.60	11.10	10.30	12.72	13.22	12.79	8.22	14.16	11.30	13.70	9.04	10.17	14.25	11.43	11.12	12.68	11.86	10.91	11.51	12.85	11.59	13.13	8.78	10.50	14.43	12.57	9.59	10.76
MW-40	Outside	20.05	13.33	19.36	13.64	12.34	17.61	19.14	17.36	10.38	18.65	14.36	17.65	10.89	13.42	18.24	13.73	14.75	17.58	14.49	13.59	16.35	17.79	15.11	17.43	10.84	13.60	19.73	15.79	11.90	13.86
MW-41	Outside	19.74	12.88	19.40	13.09	11.90	17.81	19.26	17.52	9.60	18.87	14.00	17.93	10.26	13.10	19.36	13.28	14.53	17.72	14.37	13.16	16.04	18.05	14.89	17.49	10.35	13.26	19.76	16.75	11.43	13.54
MW-42	Outside	19.78	14.70	15.51	15.25	14.53	14.90	15.27	15.41	13.28	14.73	15.25	15.24	13.75	14.10	17.99	15.42	14.76	14.82	14.62	15.06	15.20	14.53	15.02	15.42	13.29	14.82	15.54	15.70	14.32	14.67
MW-43	Outside	17.92	13.81	15.38	13.89	12.06	13.54	14.11	13.72	14.08	13.38	14.41	15.43	10.55	12.22	14.16	13.65	11.91	13.32	12.77	14.36	12.70	12.34	12.91	13.58	10.30	12.51	14.80	12.60	13.20	12.64
MW-44	Outside	17.89	11.17	17.42	11.95	10.19	15.73	17.35	15.38	8.13	16.81	12.59	16.70	8.42	11.38	17.39	12.05	12.52	15.66	12.75	12.32	13.24	15.89	12.96	15.14	9.26	11.48	17.50	13.85	10.15	11.72
MW-45	Outside	17.65	11.51	15.60	12.34	11.08	14.29	15.26	13.65	9.69	13.78	12.68	13.82	10.51	11.25	15.20	12.61	11.77	13.65	12.65	12.46	12.35	30.08	12.57	13.75	8.39	11.71	18.33	12.59	11.42	11.71
MW-46	Outside	17.78	10.58	18.98	10.66	9.59	16.61	19.39	16.37	7.38	18.28	12.03	16.63	7.75	10.78	19.74	10.57	12.81	16.78	12.20	11.09	13.42	17.53	12.64	16.21	10.33	10.80	20.02	14.32	9.09	11.34
MW-47	Inside	18.20	15.61	15.68	15.80	15.96	16.69	15.81	15.76	15.25	15.42	15.88	15.69	15.30	14.93	15.70	16.19	15.45	15.09	15.56	15.71	15.49	15.55	15.62	15.88	15.42	15.65	15.89	15.64	15.62	16.52
MW-48	Inside	18.08	15.29	15.46	15.79	15.49	15.48	15.66	15.71	15.14	15.42	15.53	15.39	15.33	14.63	15.50	15.77	15.15	14.90	14.70	15.37	15.05	15.14	15.28	15.58	14.92	15.23	15.35	15.33	15.21	16.05
MW-49	Inside	18.49	15.96	15.92	15.92	16.21	15.97	16.12	16.06	15.54	15.75	16.08	15.93	15.57	15.20	15.95	16.33	15.70	15.37	15.81	15.86	15.71	15.91	15.92	16.17	15.59	15.86	16.11	15.92	15.87	16.85
MW-50	Inside	19.05	16.19	16.31	16.05	16.21	16.42	16.59	16.94	15.70	17.50	15.35	15.99	16.22	15.46	16.50	16.36	15.96	16.05	16.05	15.87	16.06	16.18	16.11	16.39	15.65	16.05	16.55	16.19	15.84	16.89
MW-51	Inside	18.15	15.20	15.10	14.98	15.41	15.37	15.24	15.07	15.90	15.00	15.02	14.99	14.85	14.41	14.90	15.17	14.86	14.48	14.31	16.13	14.89	14.88	14.78	15.05	14.96	14.73	14.72	14.82	14.59	15.27
MW-52	Inside	18.00	14.94	15.71	14.91	14.87	15.65	15.92	15.36	14.18	15.51	14.91	15.46	14.06	14.30	15.23	15.24	14.91	15.14	14.92	16.45	15.02	15.41	15.09	15.60	14.22	15.96	15.94	15.28	14.57	15.64
MW-53	Inside	18.00	15.50	15.50	15.45	15.85	15.56	15.72	15.44	15.18	15.34	15.70	15.53	15.17	14.80	15.60	15.91	15.31	14.97	15.43	14.99	14.75	15.45	15.52	15.88	15.21	30.56	15.61	15.50	13.49	16.35
MW-54	Inside	17.76	14.38	14.93	14.78	14.52	18.43 [2]	23.10 [2]	15.51	17.09	17.68	17.63	15.42	15.51	16.28	15.20	17.13	14.86	14.81	14.76	14.67	14.48	14.94	15.02	15.29	14.58	14.91	15.41	15.15	14.73	15.89
MW-55	Inside	18.07	15.46	15.43	15.38	15.77	15.49	15.77	15.53	15.04	15.28	15.52	15.50	15.10	14.74	15.53	15.80	15.22	14.87	15.05	15.34	15.18	15.39	15.45	15.65	15.18	15.25	15.53	15.41	15.40	16.10
MW-56	Inside	18.18	15.07	15.57	15.00	15.25	15.49	15.78	15.80	14.53	15.36	15.26	15.39	14.41	14.32	15.58	15.35	14.99	14.96	15.00	14.92	15.02	15.42	15.12	15.60	14.59	14.97	15.80	15.33	14.79	15.80
MW-57	Outside	19.33	13.23	13.71	13.64	13.92	12.57	14.93	13.80	12.35	12.64	13.66	13.40	12.51	12.10	13.23	13.90	12.56	12.27	12.98	13.51	12.70	13.52	13.12	13.77	12.66	13.06	13.49	13.46	13.65	13.13
MW-58	Outside	18.70	12.92	13.54	13.46	13.52	12.32	13.52	13.46	11.85	12.61	13.41	13.43	11.46	11.92	13.27	13.72	12.54	12.12	13.91	13.52	12.58	12.59	12.78	13.68	12.20	12.71	13.40	13.14	13.12	12.69
MW-59	Outside	18.51	12.77	14.18	13.33	13.11	12.79	14.06	13.72	11.41	13.20	13.20	13.61	11.10	11.87	13.82	13.51	12.55	12.32	12.94	13.26	12.70	13.02	13.09	13.89	11.74	12.59	14.05	13.21	12.68	12.57
PZ-60	Inside	18.98	16.45	16.49	16.38	16.56	15.46	16.60	16.31	16.06	16.00	16.30	16.30	16.00	15.46	16.52	16.71	16.12	15.91	16.28	16.21	16.16	16.34	16.33	16.59	16.10	17.21	16.64	16.46	16.61	17.24
PZ-61	Inside	19.04	16.68	16.96	16.93	16.94	16.69	16.82	17.41	16.24	16.45	16.85	16.69	16.33	15.91	16.69	17.18	16.43	16.07	16.60	16.71	16.47	16.53	16.62	16.89	16.45	16.66	16.91	16.65	16.68	17.51
PZ-62	Inside	18.80	16.26	16.39	16.29	16.51	16.38	16.52	17.10	15.92	15.88	16.40	16.21	15.79	15.51	16.26	16.72	16.05	15.78	16.11	16.22	16.08	16.27	16.24	16.52	16.01	16.21	16.54	16.30	16.22	17.00
PZ-63	Inside	18.51	16.06	16.02	16.02	16.27	16.07	16.24	15.93	15.64	15.84	16.14	16.02	15.64	15.27	16.25	16.36	15.78	15.49	15.80	15.98	15.78	15.93	16.00	16.22	15.79	15.93	16.16	16.05	15.95	16.85

TABLE 3: GROUNDWATER ELEVATIONS

Former Rhone-Poulenc Site, Tukwila, Washington

Well ID	Inside/Outside Barrier Wall	TOC Elevation[1] (feet)	Groundwater Elevation (feet) [1]																												
			3/7/13	6/6/13	9/12/13	12/27/13	3/17/14	6/24/14	9/23/14	12/12/14	3/23/15	6/11/15	9/14/15	12/8/15	3/17/16	6/8/16	9/22/16	12/15/16	3/16/17	6/2/17	9/28/17	12/7/17	3/22/18	6/6/18	9/27/18	12/12/18	3/14/19	6/4/19	9/18/19	12/4/19	3/19/20
B1A	Outside	18.71	10.88	9.50	9.00	8.80	9.33	9.42	10.97	9.32	9.42	9.36	8.81	9.06	9.40	9.41	8.82	9.40	9.87	10.68	9.08	9.80	9.52	9.50	8.83	8.80	9.39	9.39	9.02	8.83	9.53
B1B	Outside	18.47	9.20	8.51	9.87	10.45	10.06	8.52	9.16	11.56	9.67	10.15	9.04	11.46	10.76	8.90	9.69	10.76	10.34	9.57	9.93	10.17	9.88	10.09	8.92	11.00	10.77	8.54	9.42	10.52	10.73
A2	Inside	18.59	2.51	2.44	2.47	2.24	2.52	2.34	2.67	2.97	2.72	2.33	2.52	2.87	2.73	2.49	2.00	2.73	3.11	2.59	2.51	1.74	2.67	2.61	2.31	2.74	2.53	2.29	2.54	2.51	1.67
DM-3A	Inside	17.81	2.62	2.59	2.62	2.35	2.78	2.43	2.80	2.35	2.80	10.08	2.59	2.96	2.82	2.59	2.10	2.82	3.40	2.74	NM	2.83	2.75	2.73	2.40	2.85	3.06	6.16	2.67	2.62	2.02
DM-3B	Inside	17.81	10.55	6.56	10.29	10.78	8.20	4.72	7.05	3.07	7.43	2.41	7.39	11.72	9.71	6.64	10.30	9.71	8.44	10.16	NM	9.22	7.84	7.70	7.40	11.61	10.70	2.41	8.15	10.96	10.45
DM-4	Inside	19.40	2.54	2.48	2.50	2.24	2.54	2.40	2.68	2.93	2.74	2.39	2.48	2.89	2.77	2.50	2.10	2.77	3.12	2.50	2.74	2.71	2.68	3.22	2.20	2.75	2.44	2.29	2.41	2.53	1.70
DM-5	Inside	18.80	2.65	2.65	2.66	2.35	2.63	2.44	2.78	2.98	2.84	2.56	2.68	2.99	2.85	2.60	2.26	2.85	3.20	2.77	2.70	2.87	2.77	2.73	2.49	2.80	2.68	2.45	2.68	2.64	1.93
DM-8	Outside	20.40	6.42	1.15	6.00	7.01	2.78	1.34	2.98	9.36	1.78	5.48	2.65	9.09	5.10	1.08	5.78	5.10	2.80	5.35	6.12	4.65	2.51	4.97	2.88	8.81	6.25	0.79	4.20	7.49	5.71
EX-1	Inside	19.16	2.57	1.46	1.38	2.30	2.56	2.42	1.97	3.00	2.78	2.39	2.56	2.90	2.79	2.57	2.07	2.79	3.16	2.64	2.54	2.78	2.74	2.64	2.37	2.80	2.57	2.35	2.59	2.57	1.73
EX-2	Inside	19.21	2.64	2.61	2.61	2.42	2.64	2.57	2.80	3.07	2.84	2.43	2.60	2.97	2.88	2.62	2.18	2.88	3.22	2.19	2.66	6.80	2.80	2.83	1.90	2.83	2.12	2.37	2.11	2.62	1.80
EX-3	Inside	18.92	2.62	2.55	2.64	2.33	2.62	2.45	2.79	3.02	2.82	2.50	1.67	2.98	2.86	2.60	2.22	2.86	3.18	2.71	2.87	1.66	2.78	2.70	2.43	2.91	2.66	0.97	2.61	2.61	1.82
MW-17	Inside	18.55	2.49	2.55	2.43	2.09	2.43	2.20	2.63	2.67	2.81	2.33	2.50	2.84	2.85	2.44	2.14	2.85	2.94	2.58	2.53	2.73	2.54	2.48	2.27	2.74	2.59	2.37	2.50	2.53	1.54
MW-20	Inside	18.96	2.50	2.46	2.54	2.20	2.52	2.34	2.65	2.94	2.71	2.38	0.48	2.85	2.74	2.50	2.12	2.74	3.08	2.62	2.59	2.61	2.63	2.57	2.26	2.76	2.54	2.22	2.52	2.48	1.70
MW-27	Inside	18.83	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM	NM
MW-28	Inside	18.74	2.49	2.56	2.59	2.24	2.47	2.25	1.85	2.93	2.70	2.39	2.51	2.87	2.74	2.51	2.18	2.74	3.08	2.71	2.61	2.75	2.59	2.53	2.32	2.79	2.64	2.39	2.53	2.58	1.67
MW-29	Inside	18.37	2.46	2.49	2.49	2.17	2.46	2.35	2.60	2.85	2.67	2.34	2.49	2.86	2.71	2.46	2.13	2.71	3.03	2.62	2.58	2.72	2.53	2.37	2.14	2.74	2.46	2.36	2.37	2.53	1.52
MW-38R	Outside	16.83	6.33	1.88	5.91	6.54	3.70	2.06	3.07	8.45	3.22	5.53	3.42	8.52	5.52	1.90	5.55	5.52	3.78	5.58	5.95	5.10	3.39	5.22	3.41	8.13	6.37	1.81	4.63	7.18	6.06
MW-39	Outside	16.65	6.15	2.05	5.55	6.35	3.93	3.43	3.86	8.43	2.49	5.35	2.95	7.61	5.53	2.40	5.22	5.53	3.97	4.79	5.74	5.14	3.80	5.06	3.52	7.87	6.15	2.22	4.08	7.06	5.89
MW-40	Outside	20.05	6.72	0.69	6.41	7.71	2.44	0.91	2.69	9.67	1.40	5.69	2.40	9.16	5.30	1.81	6.32	5.30	2.47	5.56	6.46	3.70	2.26	4.94	2.62	9.21	6.45	0.32	4.26	8.15	6.19
MW-41	Outside	19.74	6.86	0.34	6.65	7.84	1.93	0.48	2.22	10.14	0.87	5.74	1.81	9.48	5.21	0.38	6.46	5.21	2.02	5.37	6.58	3.70	1.69	4.85	2.25	9.39	6.48	-0.02	2.99	8.31	6.20
MW-42	Outside	19.78	5.08	4.27	4.53	5.25	4.88	4.51	4.37	6.50	5.05	4.53	4.54	6.03	5.02	1.79	4.36	5.02	4.96	5.16	4.72	4.58	5.25	4.76	4.36	6.49	4.96	4.24	4.08	5.46	5.11
MW-43	Outside	17.92	4.11	2.54	4.03	5.86	4.38	3.81	4.20	3.84	4.54	3.51	2.49	7.37	6.01	3.76	4.27	6.01	4.60	5.15	3.56	5.22	5.58	5.01	4.34	7.62	5.41	3.12	5.32	4.72	5.28
MW-44	Outside	17.89	6.72	0.47	5.94	7.70	2.16	0.54	2.51	9.76	1.08	5.30	1.19	9.47	5.37	0.50	5.84	5.37	2.23	5.14	5.57	4.65	2.00	4.93	2.75	8.63	6.41	0.39	4.04	7.74	6.17
MW-45	Outside	17.65	6.14	2.05	5.31	6.57	3.36	2.39	4.00	7.96	3.87	4.97	3.83	7.14	5.88	2.45	5.04	5.88	4.00	5.00	5.19	5.30	-12.43	5.08	3.90	9.26	5.94	-0.68	5.06	6.23	5.94
MW-46	Outside	17.78	7.20	-1.20	7.12	8.19	1.17	-1.61	1.41	10.40	-0.50	5.75	1.15	10.03	4.97	-1.96	7.21	4.97	1.00	5.58	6.69	4.36	0.25	5.14	1.57	7.45	6.98	-2.24	3.46	8.69	6.44
MW-47	Inside	18.20	2.59	2.52	2.40	2.24	1.51	2.39	2.44	2.95	2.78	2.32	2.51	2.90	2.75	2.50	2.01	2.75	3.11	2.64	2.49	2.71	2.65	2.58	2.32	2.78	2.55	2.31	2.56	2.58	1.68
MW-48	Inside	18.08	2.79	2.62	2.29	2.59	2.60	2.42	2.37	2.94	2.66	2.55	2.69	2.75	2.93	2.58	2.31	2.93	3.18	3.38	2.71	3.03	2.94	2.80	2.50	3.16	2.85	2.73	2.75	2.87	2.03
MW-49	Inside	18.49	2.53	2.57	2.57	2.28	2.52	2.37	2.43	2.95	2.74	2.41	2.56	2.92	2.79	2.54	2.16	2.79	3.12	2.68	2.63	2.78	2.58	2.57	2.32	2.90	2.63	2.38	2.57	2.62	1.64
MW-50	Inside	19.05	2.86	2.74	3.00	2.84	2.63	2.46	2.11	3.35	1.55	3.70	3.06	2.83	3.09	2.55	2.69	3.09	3.00	3.00	3.18	2.99	2.87	2.94	2.66	3.40	3.00	2.50	2.86	3.21	2.16
MW-51	Inside	18.15	2.95	3.05	3.17	2.74	2.78	2.91	3.08	2.25	3.15	3.13	3.16	3.30	3.29	3.25	2.98	3.29	3.67	3.84	2.02	3.26	3.27	3.37	3.10	3.19	3.42	3.43	3.33	3.56	2.88
MW-52	Inside	18.00	3.06	2.29	3.09	3.13	2.35	2.08	2.64	3.82	2.49	3.09	2.54	3.94	3.09	2.77	2.76	3.09	2.86	3.08	1.55	2.98	2.59	2.91	2.40	3.78	2.04	2.06	2.72	3.43	2.36
MW-53	Inside	18.00	2.50	2.50	2.55	2.15	2.44	2.28	2.56	2.82	2.66	2.30	2.47	2.83	2.69	2.40	2.09	2.69	3.03	2.57	3.01	3.25	2.55	2.48	2.12	2.79	-12.56	2.39	2.50	4.51	1.65
MW-54	Inside	17.76	3.38	2.83	2.98	3.24	NM	NM	2.25	0.67	0.08	0.13	2.34	2.25	2.90	2.56	0.63	2.90	2.95	3.00	3.09	3.28	2.82	2.74	2.47	3.18	2.85	2.35	2.61	3.03	1.87
MW-55	Inside	18.07	2.61	2.64	2.69	2.30	2.58	2.30	2.54	3.03	2.79	2.55	2.57	2.97	2.85	2.54	2.27	2.85	3.20	3.02	2.73	2.89	2.68	2.62	2.42	2.89	2.82	2.54	2.66	2.67	1.97
MW-56	Inside	18.18	3.11	2.61	3.18	2.93	2.69	2.40	2.38	3.65	2.82	2.92	2.79	3.77	3.19	2.60	2.83	3.19	3.22	3.18	3.26	3.16	2.76	3.06	2.58	3.59	3.21	2.38	2.85	3.39	2.38
MW-57	Outside	19.33	6.10	5.62	5.69	5.41	6.76	4.40	5.53	6.98	6.69	5.67	5.93	6.82	6.77	6.10	5.43	6.77	7.06	6.35	5.82	6.63	5.81	6.21	5.56	6.67	6.27	5.84	5.87	5.68	6.20
MW-58	Outside	18.70	5.78	5.16	5.24	5.18	6.38	5.18	5.24	6.85	6.09	5.29	5.27	7.24	6.16	5.43	4.98	6.16	6.58	4.79	5.18	6.12	6.11	5.92	5.02	6.50	5.99	5.30	5.56	5.58	6.01
MW-59	Outside	18.51	5.74	4.33	5.18	5.40	5.72	4.45	4.79	7.10	5.31	5.31	4.90	7.41	5.96	4.69	5.00	5.96	6.19	5.57	5.25	5.81	5.49	5.42	4.62	6.77	5.92	4.46	5.30	5.83	5.94
PZ-60	Inside	18.98	2.53	2.49	2.60	2.42	3.52	2.38	2.67	2.92	2.98	2.68	2.68	2.98	2.86	2.46	2.27	2.86	3.07	2.70	2.77	2.82	2.64	2.65	2.39	2.88	1.77	2.34	2.52	2.37	1.74
PZ-61	Inside	19.04	2.36	2.08	2.11	2.10	2.35	2.22	1.63	2.80	2.59	2.19	2.35	2.71	2.61	2.35	1.86	2.61	2.97	2.44	2.33	2.57	2.51	2.42	2.15	2.59	2.38	2.13	2.39	2.36	1.53
PZ-62	Inside	18.80	2.54	2.41	2.51	2.29	2.42	2.28	1.70	2.88	2.92	2.40	2.59	3.01	2.75	2.54	2.08	2.75	3.02	2.69	2.58	2.72	2.53	2.56	2.28	2.79	2.59	2.26	2.50	2.58	1.80
PZ-63	Inside	18.51	2.45	2.49	2.49	2.24	2.44	2.27	2.58	2.87	2.67	2.37	2.49	2.87	2.73	2.26	2.15	2.73	3.02	2.71	2.53	2.73	2.58	2.51	2.29	2.72	2.58	2.35	2.46	2.56	1.66

Notes

1. Elevations in feet above mean sea level relative to North American Vertical Datum of 1988 (NAVD88 datum).
2. These measurements are considered erroneous because they are inconsistent with past water level measurements within the barrier wall.

Abbreviations

NM = not measured
TOC = top of casing

TABLE 4: GROUNDWATER ANALYTICAL RESULTS, MARCH 2020 [1,2]

Former Rhone-Poulenc Site, Tukwila, Washington

all concentrations in micrograms per liter (µg/L)

Analyte	PRG[3]	B1A		DM-8[4]		MW-38R[4]		MW-39[4]		MW-40[4]		MW-41[4]		MW-42[4]		MW-43[4]		MW-44[4]		MW-44 DUP		MW-45[4]		MW-46[4]		EX-3	
		3/18/2020		3/18/2020		3/19/2020		3/19/2020		3/18/2020		3/18/2020		3/18/2020		3/19/2020		3/19/2020		3/19/2020		3/19/2020		3/20/2020		3/18/2020	
Total Metals																											
Aluminum	87	40.0	U	40.0	U	**169**		**458**		**144**	J+	**273**	J+	**488**	J+	**1,000**	U	**200**	U	**200**	U	**2,290**		20.0	U	**494**	J+
Arsenic	8.0	0.802		0.808		2.21		1.85		0.650		2.22		1.99		**14.9**		**10.4**		**10.1**		2.60		0.400	U	3.93	
Cadmium	0.25	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	**0.50**	U	0.20	U	**5.00**	U	**1.00**	U	**1.00**	U	0.562		0.20	U	**0.50**	U
Chromium	100	1.00	U	1.00	U	9.53		7.83		3.27	J+	15.5		9.39	J+	**212**		62.9		60.3		9.69		0.967	J+	24.6	
Copper	8.0	1.00	U	1.00	U	2.09	J+	6.72	J+	3.65	J+	**19.1**		**8.51**		**48.7**		**63.1**		**61.9**		**13.4**	J+	1.00	U	**21.5**	
Lead	2.5	0.20	U	0.20	U	0.20	U	0.47		0.37		1.77		0.476		**5.00**	U	**4.30**		**4.21**		1.96		0.20	U	1.77	
Mercury	0.01	**0.020**	U	**0.020**	U	**0.020**	U	**0.020**	U	**0.020**	U	**0.019**	J	**0.020**	U	**0.083**		**0.100**		**0.096**		**0.018**	J	**0.020**	U	**0.017**	J
Nickel	8.2	1.00	U	1.61		1.00	U	1.33		1.07		2.52		2.01		**41.2**		**21.2**		**20.3**		3.01		1.00	U	2.50	U
Selenium	5.0	1.00	U	1.00	U	1.00	U	1.00	U	1.10		2.50	U	1.65	U	**25.0**	U	5.00	U	5.00	U	1.44		1.00	U	2.50	U
Thallium	NE	0.40	U	0.40	U	0.40	U	0.20	U	0.40	U	1.00	U	0.40	U	10.0	U	2.00	U	2.00	U	0.40	U	0.40	U	1.00	U
Vanadium	63	2.07	J+	3.78		52.4		32.0		10.2		**104**		35.9		**978**		**446**		**433**		38.7		7.72		**142**	
Zinc	56	8.00	U	8.00	U	8.00	U	8.00	U	8.09		20.0		8.0	U	**200**	U	40.0	U	40.0	U	41.5		8.0	U	20.0	U
BTEX																											
Benzene	2.02	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.28		0.20	U	1.00	U	1.00	U	1.00	U	0.20	U	0.20	U	0.20	U
Ethylbenzene	700/17,056[5]	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	1.00	U	1.00	U	1.00	U	0.20	U	0.20	U	0.20	U
m,p-Xylene	1,000[6]	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	0.40	U	2.00	U	2.00	U	2.00	U	0.40	U	0.40	U	0.40	U
o-Xylene	1,000[6]	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	1.00	U	1.00	U	1.00	U	0.20	U	0.20	U	0.20	U
Toluene	1,000/1,280[5]	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	0.20	U	168		291		304		0.25		0.20	U	0.20	U

Notes

1. Data flags are as follows:
   U = Analyte not detected above the indicated laboratory reporting limit.
   J = The result is estimated.
   J+ = The result is estimated, with a potential high bias.
2. **Bold** values exceed the PRGs.
3. Values from EPA (2014c) for metals and benzene are for protection of both potable groundwater and surface water and apply to all wells, except where noted otherwise.
4. Monitoring wells that discharge to surface water; remaining wells discharge to potable groundwater.
5. Values presented are for protection of potable groundwater (MTCA Method A) and surface water (MTCA Method B), respectively. Wells that discharge to surface water are indicated with footnote 5.
6. Values presented are MTCA Method Method A for protection of potable groundwater.

0.Abbreviations

µg/L = micrograms per liter
BTEX = benzene, toluene, ethylbenzene, and xylenes
DUP = field duplicate
EPA = U.S. Environmental Protection Agency
MTCA = Model Toxics Control Act
NE = not established
PRG = preliminary remediation goal

Appendix A

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GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER B-1A

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA

Date: 3/18/20

Project Number: 8769.005/1

Weather Conditions: Clear, 30s

Location: 92nd and E. Marginal Way, Tukwila, WA

Sampler: BL, WY, GA

Wind Speed/Direction: S, 13mph

WELL INFORMATION

Casing Diameter (in): 2"

Top of Casing Elevation (ft):

Initial Depth to Water (ft): 9.16

Wellhead Condition: 0/3 bolts, good

Groundwater Elevation (ft): —

Depth of Well Casing (ft): —

Actual Purge Volume (gal): 2.3 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
10.01	0807	6.71	1.197	14.7	-139.9	0.05	11.33	-
—	0810	—	—	—	—	—	—	-
10.01	0813	6.73	1.194	14.3	-168.9	-0.03	8.65	-
10.01	0816	6.74	1.188	14.3	-179.9	-0.3	10.96	-
10.04	~~0819~~ 0821	6.74	1.179	14.4	-201.5	-0.04	9.70	—
9.95	0824	6.75	1.173	14.3	-187.6	-0.05	8.81	—
9.95	0827	6.73	1.169	14.2	-178.9	-0.04	3.30	—
9.35	0830	6.74	1.167	14.3	-179.4	-0.5	3.40	—
9.98	0833	6.74	1.164	14.3	-188.1	-0.5	3.22	—

Sample ID No.: RP-031820-01

EXTRA VOLUME FOR MS/MSD

Water Level Ind. Model & No.: Solinst 101

ORP/DO Meter Model & No.: YSI Pro DSS

Purge Equipment Used: QED Well Wizard Dedicated Sampling System

Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 0804

Purge Completion Time: 0833

Average Purge Rate (mL/min): 300 mL/min

Analytical Lab: Analytical Resources, Inc

Sample Collection Time: 0834

Purging Method: QED Bladder pump

Containers Used: 9 x40ml, 2 x1L (HNO_3),

Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 9.61' TOC

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GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER EX-3

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA

Date: 3/18/20

Project Number: 8769.005/1

Weather Conditions: Clear 35°F

Location: 92nd and E. Marginal Way, Tukwila, WA

Sampler: BL

Wind Speed/Direction: S, Light

WELL INFORMATION

Casing Diameter (in): 2"

Top of Casing Elevation (ft): NA

Initial Depth to Water (ft): NA

Wellhead Condition: NA

Groundwater Elevation (ft): —

Depth of Well Casing (ft): —

Actual Purge Volume (gal): ~~NA~~ 525 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
—	1134	6.71	1,380	14.9	-151.3	0.04	142.7	
—	1137	6.71	1.389	14.9	-161.1	-0.02	5.20	
—	1143	6.71	1,388	14.9	-164.8	-0.03	7.5	
—	1146	6.71	1.387	14.9	-167.7	-0.04	9.10	
—	1149	6.71	1.384	14.9	-170.4	-0.05	7.20	
—	1152	6.71	1.395	14.9	-170.5	-0.03	8.81	Pump off 1150, back on 1152
—	1155	6.71	1,393	14.9	-176.4	-0.03	9.20	
—	1158	6.71	1,357	14.8	-173.6	-0.06	4.61	
—	1201	6.71	1.392	15.0	-177.5	-0.07	4.40	
—	1204	6.71	1.392	15.0	-178.4	-0.07	4.70	

Sample ID No.: RP-031820-03

Water Level Ind. Model & No.: Solinst 101

ORP/DO Meter Model & No.: YSI Pro DSS

Purge Equipment Used: Pump + Treatsystem

Sampling Equipment Used:

Purge Start Time: 1129

Purge Completion Time: 1204

Average Purge Rate (mL/min): 15 gpm

Analytical Lab: Analytical Resources, Inc

Sample Collection Time: 1205

Purging Method: QED Bladder pump

Containers Used: 4 x40ml, 2 x1L (HNO_3),

Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = NA

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GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-42

Project Name: Container Properties Former Rhone Poulenc, Inc., Tukwila, WA
Date:
Project Number: 8769.005/1
Weather Conditions: Sunny, 80°F
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BL
Wind Speed/Direction: Slight

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 15.21
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 1.9 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
14.99	1311	7.54	2.888	12.4	-184.5	0.45	10.36	—
15.03	1314	7.62	2.910	12.8	-190.6	0.16	33.71	—
15.10	1317	7.67	2.904	12.8	-200.3	0.05	131.1	—
15.38	1320	7.68	2.905	12.9	-209.4	-0.01	538	—
15.68	1323	7.70	2.916	13.0	-221.9	-0.04	659	
15.69	1326	7.69	2.933	13.0	-223.6	-0.05	253	
15.70	1329	7.70	2.926	13.0	-225.9	-0.05	615	Bubbles on probe

Sample ID No.: RP-031820-04
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 1310
Purge Completion Time: 1330
Average Purge Rate (mL/min): 360 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 1335
Purging Method: QED Bladder pump
Containers Used: 4 x 40ml, 1 x 1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 15.39' TOC
- Turb never stabalized, & bubbles accumulated on probe

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GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER DM-8

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA
Date: 3/18/20
Project Number: 8769.005/1
Weather Conditions: 50°F Sunny
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BC
Wind Speed/Direction: S Light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 14.43'
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 3.9 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
14.48	1412	6.72	3.640	13.1	-81.1	0.54	7.36	—
14.48	1415	6.72	3.593	13.1	-83.9	0.36	7.89	—
14.50	1418	6.72	3.469	13.0	-92.3	0.16	7.32	—
14.53	1421	6.72	3.364	13.0	-96.6	0.13	12.42	—
—	1427	6.71	3.267	13.0	-100.2	0.09	8.66	—
14.59	1430	6.71	3.208	13.0	-102.2	0.07	7.38	—
14.61	~~1433~~ 1436	6.71	3.084	13.0	-106.9	0.05	9.44	—
14.62	1439	6.71	3.050	13.0	-108.9	0.05	5.46	—
14.67	~~2°~~ 1442	6.71	3.009	13.0	-111.2	0.04	5.09	—

Sample ID No.: BR RP-031820-05
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 1409
Purge Completion Time: 1455
Average Purge Rate (mL/min): 320 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 1443
Purging Method: QED Bladder pump
Containers Used: 4x40ml, 4 x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 14.71' TOC
Turb slightly above 5 NTU but stable

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GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-41

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA
Date: 3/18/20
Project Number: 8769.005/1
Weather Conditions: 50°F Sunny
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BL / GEO
Wind Speed/Direction: 5, light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 14.69
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 1.7 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
15.15	1605	9.31	6.275	12.7	-296.4	0.81	13.57	
15.21	1608	9.66	6.387	12.9	-312.5	0.22	21.31	
15.20	1611	9.96	6.512	12.9	-362.6	0.03	24.04	
15.25	1614	10.02	6.613	12.8	-375.5	-0.01	15.13	
15.28	1617	10.02	6.792	12.9	-381.6	-0.03	15.72	
15.35	1620	10.02	6.892	13.0	-385.4	-0.04	26.63	
15.39	1623	10.02	6.986	12.9	-390.0	-0.05	25.92	
15.46	1626	10.03	6.945	12.9	-393.1	-0.05	29.87	
15.50	1629	10.01	6.960	12.9	-389.7	-0.06	6.67	
15.61	1632	10.02	6.968	12.9	-394.4	-0.06	10.87	minor bubbles

Sample ID No.: RP-031820 - 006
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 1602
Purge Completion Time: 1632
Average Purge Rate (mL/min): 220 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 1633
Purging Method: QED Bladder pump
Containers Used: 4 x 40ml, 1 x 1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 15.90' TOC
Turb not stabilized, minor bubbles on probe

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-40

Project Name: Container Properties Former Rhone Poulenc, Inc., Tukwila, WA
Date: 3/18/20
Project Number: 8769.005/1
Weather Conditions: Sunny, 50°F
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BL
Wind Speed/Direction: S, Light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 16.08
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 0.9 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
16.32	~~1715~~	9.45	0.045	17.1	-174.0	9.58	10.16	Hose came off, No purge water
16.38	1718	9.39	0.042	17.9	-158.5	9.35	10.17	
16.47	1721	9.27	0.041	18.0	-138.4	9.33	10.24	
16.49	1724	9.21	0.041	18.0	-126.6	9.35	10.22	
—	1727	9.15	—	17.9	—	9.37	10.33	
16.93	~~1745~~ 1735	7.76	14.031	11.7	-213.7	2.94	8.93	Water purging
—	1750	~~11.763~~	13.786	11.9	-234.3	1.34	24.45	
—	1756	7.70	13.330	12.0	-254.1	0.88	30.09	
17.17	1759	7.72	13.216	11.9	-260.4	0.70	29.24	
17.17	1802	7.75	13.065	11.9	-272.6	0.48	27.62	
17.45	1805	7.80	12.769	12.1	-286.3	0.29	~~24~~ 23.60	~~HP~~ Increased flow
17.62	1808	7.84	12.565	12.5	-304.5	0.12	18.87	
17.71	1811	7.91	12.420	12.6	-319.5	0.04	15.81	
17.72	1814	7.93	12.375	12.5	-328.5	0.03	14.34	
17.78	1817	7.96	12.333	12.5	-333.7	0.00	10.30	

Sample ID No.: RP-031820-07
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: ~~1712~~ 1745
Purge Completion Time: ~~1817~~ 1817
Average Purge Rate (mL/min): 100 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: ~~1818~~ 1818
Purging Method: QED Bladder pump
Containers Used: 4x40ml, 1 x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 17.71' TOC
ORP not stable +/- 10 mv, keeps decreasing

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-44

Project Name: Container Properties Former Rhone Poulenc, Inc., Tukwila, WA

Date: 3/19/20

Project Number: 8769.005/1

Weather Conditions: 40°F, Dark, no clouds

Location: 92nd and E. Marginal Way, Tukwila, WA

Sampler: BC

Wind Speed/Direction: SE, light

WELL INFORMATION

Casing Diameter (in): 2"

Top of Casing Elevation (ft):

Initial Depth to Water (ft): 11.17'

Wellhead Condition:

Groundwater Elevation (ft): —

Depth of Well Casing (ft): —

Actual Purge Volume (gal): 3.8 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
11.41	0704	11.10	7,274	13.4	-390.2	0.09	5.61	
11.37	0707	11.16	7,379	13.4	-415.6	0.03	5.51	
11.38	0710	11.17	7,475	13.4	-432.3	0.00	6.43	
11.42	0713	11.18	7,563	13.4	-444.9	-0.02	6.39	
11.51	0716	11.18	7,662	13.4	-457.2	-0.03	4.85	
11.53	0719	11.18	7,707	13.4	-462.1	-0.04	6.20	
—	0722	11.17	7,729	13.4	-465.5	-0.04	5.79	minor bubbles on probe
11.63	0725	11.17	7,752	13.4	-469.0	-0.05	4.77	

Sample ID No.: RP-031920-01 **DUP Sample ID No.:** RP-031920-01

Water Level Ind. Model & No.: Solinst 101

ORP/DO Meter Model & No.: YSI Pro DSS

Purge Equipment Used: QED Well Wizard Dedicated Sampling System

Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 0701

Purge Completion Time: 0725

Average Purge Rate (mL/min): 600 mL/min

Analytical Lab: Analytical Resources, Inc

Sample Collection Time: 0726

Purging Method: QED Bladder pump

Containers Used: 4 x40ml, 1x1L (HNO_3),

Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 11.90' TOC

Turb slightly above 5, minor bubbles on probe, Duplicate collected @ 0740
4 x 40mL, 1x1L collected for dup, BTEX, Total Metals

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-43

Project Name: Container Properties Former Rhone Poulenc, Inc., Tukwila, WA

Date: 3/19/20

Project Number: 8769.005/1

Weather Conditions: SE, light

Location: 92nd and E. Marginal Way, Tukwila, WA

Sampler: BL

Wind Speed/Direction: 40°F, sunny

WELL INFORMATION

Casing Diameter (in): 2"

Top of Casing Elevation (ft):

Initial Depth to Water (ft): 12.11'

Wellhead Condition:

Groundwater Elevation (ft): —

Depth of Well Casing (ft): —

Actual Purge Volume (gal): 1.1 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
13.96	0818	11.13	6.513	12.0	-328.8	0.19	22.74	
14.46	0821	11.28	7.136	12.5	-428.5	0.01	59.81	
14.83	~~0824~~ 0830	11.28	7.533	12.4	-472.3	-0.05	52.56	
15.46	0833	11.24	7.401	12.3	-475.8	-0.06	22.10	Bubbles on probe
15.55	0836	11.21	7.190	12.3	-478.5	-0.06	23.90	↓
—	0839	11.14	6.646	12.3	-482.2	-0.07	15.78	
15.99	0842	11.14	6.855	12.3	-482.0	-0.07	13.50	

Sample ID No.: RP-031920-03

Water Level Ind. Model & No.: Solinst 101

ORP/DO Meter Model & No.: YSI Pro DSS

Purge Equipment Used: QED Well Wizard Dedicated Sampling System

Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 0815

Purge Completion Time: 0842

Average Purge Rate (mL/min): 150 mL/min

Analytical Lab: Analytical Resources, Inc

Sample Collection Time: 0843

Purging Method: QED Bladder pump

Containers Used: 4 x 40ml, 1 x 1L (HNO_3),

Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 16.99' TOC

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-45

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA
Date: 3/19/20
Project Number: 8769.005/1
Weather Conditions: Sunny, 45°F
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BL
Wind Speed/Direction: SE, Light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 11.87
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 1.1 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
13.02	0910	7.33	2.098	12.5	491.6	~~2.70~~ 0.27	43.23	Bubbles on probe
13.03	0913	7.37	2097	12.6	-204.9	0.10	105.71	
-	0916	7.42	2.086	12.6	-218.9	0.03	320.04	
13.22	0919	7.45	2.100	12.7	-223.7	0.00	184.16	
-	0922	7.45	2087	12.7	-231.7	-0.02	453	
13.22	0925	7.45	2.095	12.6	-232.3	-0.02	509	
13.26	0928	7.46	2.104	12.7	-234.5	-0.03	172	

Sample ID No.: RP-031920-04
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 0907
Purge Completion Time: 0928
Average Purge Rate (mL/min): 200 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 0929
Purging Method: QED Bladder pump
Containers Used: 9 x40ml, 1 x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 12.99' TOC
Bubbles on probe, Turb not stabilized, MS / MSD, 9 VOAs, 1 total Metal

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-38R

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA
Date: 3/19/20
Project Number: 8769.005/1
Weather Conditions: Sunny, 55°F
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BC
Wind Speed/Direction: SE, Light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 10.77'
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 5.7 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
10.83	1539	6.66	0.812	14.9	-116.3	1.13	7.97	
10.85	1542	6.67	0.809	14.9	-120.5	1.06	7.01	
10.86	1545	6.68	0.808	14.9	-122.8	1.01	6.65	
10.88	1548	6.71	0.805/838	14.9	-131.0	0.89	8.49	
10.90	1551	6.70	0.804	14.9	-131.9	0.82	5.60	
10.90	1554	6.70	0.803	14.9	-132.6	0.79	5.53	
10.97	1557	6.70	0.802	14.9	-133.7	0.72	4.54	
10.94	1600	6.70	0.801	14.9	-134.7	0.65	4.46	
10.98	1603	6.70	0.799	14.9	-135.8	0.58	4.24	

Sample ID No.: RP-031920-05
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 1536
Purge Completion Time: 1603
Average Purge Rate (mL/min): 800 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 1604
Purging Method: QED Bladder pump
Containers Used: 4 x40ml, 1 x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 10.98' TOC

amec foster wheeler

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-39

Project Name: Container Properties Former Rhone Poulenc, Inc ., Tukwila, WA
Date: 3/19/20
Project Number: 8769.005/1
Weather Conditions: Sunny, 55°F
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BC
Wind Speed/Direction: SE, Light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 10.82
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 1.6 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
11.17	1631	7.46	2.715	14.3	-166.5	0.19	38.59	↑
11.19	1634	7.46	2.700	14.3	-168.3	0.13	66.76	↑
11.21	1637	7.46	2.691	14.3	-169.7	0.10	95.23	Bubbles
11.25	1640	7.44	2.698	14.3	-171.6	0.06	29.01	↓
11.27	1643	7.46	2.689	14.3	-174.3	0.05	120.51	↓

Sample ID No.: RP-031920-07
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 1628
Purge Completion Time: 1643
Average Purge Rate (mL/min): 380 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 1644
Purging Method: QED Bladder pump
Containers Used: 4x40ml, 1x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 11.17' TOC
Bubbles on probe, turb not stable

04-All
01-1
03-All
02-1

GROUNDWATER SAMPLING LOG
Low Flow Sampling

MONITORING WELL/PIEZOMETER NUMBER MW-46

Project Name: Container Properties Former Rhone Poulenc, Inc., Tukwila, WA
Date: 3/20/20
Project Number: 8769.005/1
Weather Conditions: 40°F, Sunny
Location: 92nd and E. Marginal Way, Tukwila, WA
Sampler: BL
Wind Speed/Direction: West, light

WELL INFORMATION

Casing Diameter (in): 2"
Top of Casing Elevation (ft):
Initial Depth to Water (ft): 11.55
Wellhead Condition:
Groundwater Elevation (ft): —
Depth of Well Casing (ft): —
Actual Purge Volume (gal): 3.3 gal

PURGING MEASUREMENTS

WL (ft btoc)	Time	pH (std. units)	SC (µs/cm)	Temp. (°C)	ORP (mv)	DO (mg/L)	Turbidity (NTUs)	Notes
11.75	0752	6.40	6.210	13.3	-45.9	0.46	4.22	
11.86	0755	6.44	6.214	13.3	-51.7	0.28	3.27	
11.99	0758	6.45	6.174	13.3	-61.1	0.21	2.81	
12.16	0801	6.44	6.151	13.3	-63.1	0.18	2.83	
12.11	0804	6.44	6.112	13.3	-66.4	0.15	2.79	

Sample ID No.: RP-032020-01
Water Level Ind. Model & No.: Solinst 101
ORP/DO Meter Model & No.: YSI Pro DSS
Purge Equipment Used: QED Well Wizard Dedicated Sampling System
Sampling Equipment Used: QED Well Wizard Dedicated Sampling System

Purge Start Time: 0749
Purge Completion Time: 0804
Average Purge Rate (mL/min): 820 mL/min
Analytical Lab: Analytical Resources, Inc
Sample Collection Time: 0805
Purging Method: QED Bladder pump
Containers Used: 9 x40ml, 1 x1L (HNO_3),
Chemical Analyses: BTEX, Total Metals,

Other Field Observations: Final DTW = 12.09' TOC
MS / MSD

Appendix B

Memo

To:	Russ Bunker, Project Manager	Project:	0087690050.00002.****
From:	Caprielle Larsen	c:	Project File
Tel:	(503) 639-3400		
Fax:	(503) 620-7892		
Date:	April 27, 2020		

Subject: Round 87 Performance Monitoring Groundwater Sampling
Summary Data Quality Review – SDGs 20C0240 and 20C0271

This memorandum presents a summary data quality review for analyses of 12 primary groundwater samples, one field duplicate sample, two field blank samples, and one trip blank collected March 18, 19 and 20, 2020. The samples were submitted to Analytical Resources, Inc. (ARI), a Washington State Department of Ecology–accredited laboratory, located in Tukwila, Washington. The samples were analyzed for the following organic and/or inorganic analytes:

- Benzene, toluene, ethylbenzene, and xylenes (BTEX) by U.S. Environmental Protection Agency (EPA) Method 8260C;
- Total metals (aluminum, arsenic, cadmium, chromium, copper, lead, nickel, selenium, thallium, vanadium, and zinc) by EPA Method 200.8; and
- Total mercury by EPA Method 7470A.

Laboratory sample delivery groups (SDGs) associated with the March 2020 sampling event are listed below.

Laboratory SDG	Date Collected
20C0240	March 18, 2020
20C0271	March 19 and 20, 2020

Samples from SDGs 20C0240 and 20C0271 were received by the laboratory on March 19 and 20, respectively. Upon receipt by ARI, the sample jar information was compared to the chain-of-custody (COC) form. The temperatures of the coolers were recorded as part of the check-in procedure and were below the maximum acceptable temperature of 6 degrees Celsius.

The following observations were noted by laboratory personnel upon sample receipt.

- SDG 20C0240: Sample RP-031820-07 was listed on the COC without a collection time. The laboratory logged the sample using the time written on the container label.
- SDG 20C0240: The laboratory's Cooler Receipt Form indicates that the 1-liter bottles of samples RP-031820-02 and RP-031820-04 were mislabeled. The laboratory indicated that they identified the correct sample associations using the collection times on the bottles and matching sample colors with properly labeled aliquots.
- SDG 20C0240: A trip blank was found in the cooler with samples from this SDG but was not listed on the COC. The laboratory logged the trip blank as laboratory sample 20C0240-08.

Data review is based on method performance criteria and quality assurance/quality control (QA/QC) criteria documented in the site-specific Quality Assurance Project Plan (QAPP) (Amec Foster Wheeler, 2016). The laboratory provided validation packages containing summarized sample results, associated QA/QC data, instrument printouts, and sample preparation and injection log pages, as required by the QAPP. The data review conducted on these work orders included a review of summarized results and QA/QC data, per the requirements set forth in the QAPP (Amec Foster Wheeler, 2016). The control limits provided in the QAPP are advisory limits; therefore, the most current control limits provided by the laboratory were used to evaluate the QA/QC data. In cases where the laboratory did not track limits for an analyte, the limits in the QAPP were used. Hold times, initial and continuing calibrations, method blanks, surrogate recoveries, laboratory control samples (LCS), LCS duplicates (LCSD), matrix spike/matrix spike duplicate (MS/MSD) results, laboratory duplicate results, field duplicate results, and reporting limits were reviewed to assess compliance with applicable methods and the QAPP. If data qualification was required, data were qualified in general accordance with the definitions and use of qualifying flags outlined in the EPA National Functional Guidelines for Organic Superfund Methods Data Review (EPA, 2017a) and National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA, 2017b).

The following qualifiers may be added to the data.

- U: The analyte was analyzed for but was not detected above the reported sample quantitation limit.
- J: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.
- J+: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, with a possible high bias.
- J-: The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, with a possible low bias.
- UJ: The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.
- R: The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

Organic analyses

Samples were analyzed for BTEX by EPA Method 8260C, and the results were evaluated for the following QA/QC criteria:

1. Holding Times – Acceptable
2. Instrument Tunes – Acceptable
3. Initial Calibrations – Acceptable
4. Continuing Calibrations – Acceptable
5. Blanks – Acceptable

   The QAPP-specified frequency requirements for method and field blanks was met. The requirement for one trip blank per SDG was not met. No target volatile compounds were detected in the method, trip, or field blanks.

- No trip blank was included with the samples from SDG 20C0271. According to the project QAPP, a trip blank should be submitted with every SDG.
- A method blank was prepared with each laboratory sample batch.
- Two field blanks were submitted, as samples RP-031820-02 and RP-031920-06.

6. Surrogates – Acceptable
7. Internal Standards – Acceptable
8. LCS/LCSD – Acceptable
9. MS/MSD – Acceptable

   The laboratory performed MS/MSD analysis on samples RP-031820-01, RP-031920-04, and RP-032020-01, with acceptable accuracy and precision.

10. Field Duplicates – Acceptable

    The relative percent difference (RPD) between results is below the project-specific control limit of 30 percent.

    One field duplicate was collected at well MW-44, and the sample identifications (IDs) are listed in the table below. The RPD is not calculated if both the primary and duplicate results are not five times greater than the reporting limit, as indicated in the table below by "NC." In these instances, the absolute value of the difference between the primary and field duplicate should not exceed the reporting limit.

Sample ID/ Field Duplicate ID (Sample Location)	SDG	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
RP-031920-01/ RP-031920-02 (MW-44)	20C0271	toluene	291	304	1.0	4

Abbreviations:
µg/L = micrograms per liter

11. Reporting Limits and Laboratory Flags – Acceptable

Inorganic analyses

Samples were analyzed for total metals by the methods identified in the first paragraph of this report and were evaluated for the following criteria:

1. Holding Times – Acceptable
2. Initial Calibrations – Acceptable
3. Continuing Calibrations – Acceptable
4. Blanks – Acceptable, except as noted below.

The frequency requirements for method, instrument, calibration, and field blanks were met. Target analytes were not detected in the laboratory blanks, calibration, or instrument blanks.

SDG 20C0240: Field blank RP-031820-02, which is associated with samples in SDG 20C0240, had detections of aluminum (95.1 micrograms per liter [µg/L]), chromium (0.941 µg/L), copper (0.763 µg/L), and vanadium (0.294 µg/L).

- Wood added J+ qualifiers to the aluminum results from samples RP-031820-03, RP-031820-04, RP-031820-06, and RP-031820-07 (494, 488, 273, and 144 µg/L, respectively); the chromium results from samples RP-031820-04 (9.39 µg/L) and RP-031820-07 (3.27 µg/L); the copper result from sample RP-031820-07 (3.65 µg/L); and the vanadium result from sample RP-031820-01 (2.07 µg/L) because of potential high bias, due to the detection in the associated field blank.
- These analytes either were not detected in the remaining samples or were detected at concentrations at least ten times the detection in the field blank; therefore, data usability is not adversely affected by the detection in the associated field blank.

SDG 20C0271: Field blank RP-031920-06, which is associated with samples in SDG 20C0271, had detections of chromium and copper at concentrations of 0.594 µg/L and 3.21 µg/L, respectively.

- Wood added J+ qualifiers to the chromium result from sample RP-032020-01 (0.967 µg/L) and the copper results from samples RP-031920-04 (13.4 µg/L), RP-031920-05 (2.09 µg/L), and RP-031920-07 (6.72 µg/L) because of potential high bias, due to the detection in the associated field blank.
- Copper and chromium either were not detected in the remaining samples or were detected at concentrations at least ten times the detection in the field blank; therefore, data usability is not adversely affected by the detection in the associated field blank.

5. LCS (or Blank Spike) – Acceptable
6. Laboratory Duplicates – Acceptable, with notes below.

   ARI performed duplicate analyses on sample RP-031820-01 from SDG 20C0240 and samples RP-031920-04 and RP-032020-01 from SDG 20C0271. Precision was acceptable, with RPDs less than the laboratory-specified 20 percent maximum.

   SDG 20C0271: The RPD for mercury was high at 37.3 percent in the laboratory duplicate analysis of sample RP-031920-04. Mercury was detected in the original analysis at a concentration less than the reporting limit; therefore, the RPD is not an appropriate measure of precision. Wood found that the difference between the duplicate results was less than the reporting limit, indicating acceptable precision.

7. MS/MSD – Acceptable, with notes below.

   SDG 20C0240: ARI performed MS/MSD analysis on sample RP-031820-01. RPDs between MS and MSD results were high for arsenic (68.6 percent), cadmium (68.7 percent), chromium (70.3 percent), copper (69.2 percent), lead (68.9 percent), nickel (67.7 percent), selenium (69.1 percent), thallium (70.2 percent), vanadium (68.9 percent), and zinc (68.3 percent). The concentrations of these analytes in the MSD spike were twice the concentrations in the MS, and the RPD between MS and MSD values is not a meaningful measure of precision. Wood evaluated precision for this sample based on the laboratory duplicate RPDs, which were acceptable.

SDG 2C0271: ARI performed MS/MSD analyses on samples RP-031920-04 and RP-032020-01, with acceptable accuracy and precision.

8. Interference Check Samples – Acceptable

9. Field Duplicates – Acceptable

   The RPDs between results are below the project-specific control limit of 30 percent.

   One field duplicate was collected at well MW-44, and the sample IDs are identified in the table below. The RPD is not calculated if both the primary and duplicate results are not five times greater than the reporting limit, as indicated in the table below by "NC." In these instances, the absolute value of the difference between the primary and field duplicate should not exceed the reporting limit.

Sample ID/ Field Duplicate ID	SDG	Analyte	Primary Result (µg/L)	Duplicate Result (µg/L)	Reporting Limit (µg/L)	RPD (%)
RP-031920-01/ RP-031920-02 (MW-44)	20C0271	total arsenic	10.4	10.1	2.00	3
		total chromium	62.9	60.3	5.00	4
		total copper	63.1	61.9	5.00	2
		total lead	4.30	4.21	1.00	NC
		total mercury	0.100	0.096	0.020	NC
		total nickel	21.2	20.3	5.00	NC
		total vanadium	446	433	2.00	3

Abbreviations:
NC = not calculated

10. Reporting Limits and Laboratory Flags – Acceptable except as noted:

    The laboratory added J qualifiers to results detected at concentrations below the reporting limit. Wood agrees that these results are quantitatively uncertain and has maintained ARI's J qualifiers.

    Total Metals by EPA Method 200.8: Samples were occasionally analyzed by the laboratory at dilutions in order to overcome matrix interference. In general, the dilutions did not result non-detect results with elevated reporting limits above the preliminary remediation goals (PRGs), with the following exceptions:

    - Sample RP-031920-03 was analyzed at a 50X dilution, resulting in reporting limits exceeding the PRGs for aluminum, cadmium, lead, and zinc.
    - Samples RP-031920-01 and RP-031920-02 were analyzed at a 10X dilution, resulting in reporting limits exceeding the PRGs for aluminum and cadmium.
    - Sample RP-031820-06 was analyzed at a 5X dilution, resulting in reporting limits exceeding the PRG for cadmium.

    These samples could not be analyzed without a dilution with successful quality control samples due to the matrix. The laboratory has been instructed to always attempt to analyze the samples without a dilution if possible.

Overall assessment of data

The ARI SDGs 20C0240 and 20C0271 are 100 percent complete and usable with the addition of qualifiers discussed in this memo and summarized in Table 1. Data were J+ qualified due to detections in associated field blanks, or J qualified when results were detected at concentrations between the detection limit and the reporting limit. The data are acceptable and meet the project's data quality objectives. Evaluation of data usability is based on National Functional Guidelines (EPA, 2017a and b) and the QAPP (Amec Foster Wheeler, 2016). The samples associated with each SDG and a summary of the qualified data are presented in Table 1.

TABLE 1: SUMMARY OF DATA QUALITY REVIEW[1]

All concentrations are in micrograms per liter (µg/L)

Well ID	Sample	SDG	Qualified Analyte	Qualified Result	Qualifier Reason
B-1A	RP-031820-01	20C0240	total vanadium	2.07 J+	field blank detection
Field Blank	RP-031820-02	20C0240	not applicable		
EX-3	RP-031820-03	20C0240	total aluminum total mercury	494 J+ 0.017 J	field blank detection trace detection
MW-42	RP-031820-04	20C0240	total aluminum total chromium	488 J+ 9.39 J+	field blank detection field blank detection
DM-8	RP-031820-05	20C0240	none		
MW-41	RP-031820-06	20C0240	total aluminum total mercury	273 J+ 0.019 J	field blank detection trace detection
MW-40	RP-031820-07	20C0240	total aluminum total chromium total copper	144 J+ 3.27 J+ 3.65 J+	field blank detection field blank detection field blank detection
Trip Blank	Trip Blank	20C0240	not applicable		
MW-44	RP-031920-01	20C0271	none		
MW-44 (field dup)	RP-031920-02	20C0271	none		
MW-43	RP-031920-03	20C0271	none		
MW-45	RP-031920-04	20C0271	total copper total mercury	13.4 J+ 0.018 J	field blank detection trace detection
MW-38R	RP-031920-05	20C0271	total copper	2.09 J+	field blank detection
Field Blank	RP-031920-06	20C0271	not applicable		
MW-39	RP-031920-07	20C0271	total copper	6.72 J+	field blank detection
MW-46	RP-032020-01	20C0271	total chromium	0.967 J+	field blank detection

Notes:
1. Data qualifiers are as follows:

J = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample.

J+ = The analyte was positively identified; the associated numerical value is the approximate concentration of the analyte in the sample, with a possible high bias.

Abbreviations:
dup = duplicate
SDG = Sample Delivery Group

References

Amec Foster Wheeler Environment & Infrastructure, Inc. (Amec Foster Wheeler), 2016, Quality Assurance Project Plan, Former Rhone Poulenc Site, Tukwila, Washington: Prepared for Container Properties, LLC, Tukwila, Washington, July.

EPA, 2017a, National Functional Guidelines for Organic Superfund Methods Data Review: EPA 540-R-2017-002, January.

EPA, 2017b, National Functional Guidelines for Inorganic Superfund Methods Data Review: EPA 540-R-2017-01, January.